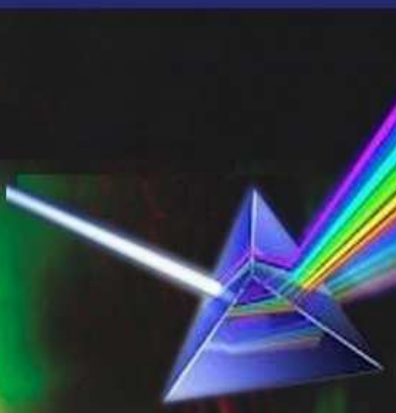
PHYSICS

Class X

Continuous Comprehensive Evaluation Method

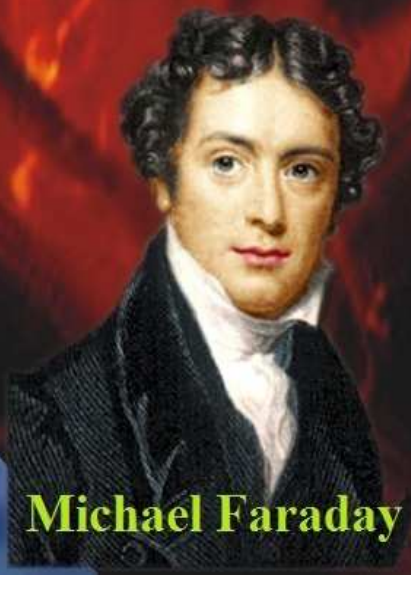


As Per The Revised Pattern of ANDHRA PRADESH

Self Improving Studymaterial

Focus on slow Leaners

Writter : G. SREEKAR



Michael Faraday

అస్తమించిన వీరుడు-అలుపెరుగని ధీరుడు-నల్ల జాతి సూర్యుడు

నెల్సన్ రోలిహ్లాహ్లా మండేలా (ఆంగ్లం **Nelson Rolihlahla Mandela**, జననం 18 జూలై ,1918) దక్షిణాఫ్రికా మాజీ అధ్యక్షుడు. ఆ దేశానికి పూర్తి స్థాయి ప్రజాస్వామ్యంలో ఎన్నికైన మొట్టమొదటి నాయకుడు. అధ్యక్షుడు కాకమునుపు ఇతను జాతి వివక్ష వ్యతిరేఖ ఉద్యమ కారుడు మరియు ఆఫ్రికన్ నేషనల్ కాంగ్రెస్ కు, దానికి సాయుధ విభాగం అయిన "ఉంకోంటో విసిజ్వే"కు అధ్యక్షుడు. జాతి వివక్షకు వ్యతిరేకంగా జరిపిన పోరాటంలో జరిగిన ఒక మారణకాండకు సంబంధించి 27 సంవత్సరాల పాటు "రోబెన్" అనే ద్వీపంలో జైలు శిక్షననుభవించాడు. 20వ శతాబ్దపు అత్యంత ప్రసిద్ధులైన ప్రపంచ నాయకులలో ఒకడు. **నల్లజాతి సూరీడు** అని పలు తెలుగు వ్యాసాలలో ఈయనను గురించి వర్ణించారు. జాతి వివక్షతకు వ్యతిరేకంగా జరిపే పొరాటాలకు, వర్ణ సమానతకు నెల్సన్ మండేలా సంకేతంగా నిలిచాడు.

ఫిబ్రవరి 11, 1990లో జైలునుండి విడుదల అయిన తరువాత నెల్సన్ మండేలా రాజకీయంగా తన లక్ష్యాన్ని సాధించడానికి, దేశంలో నెలకొన్న జాతి వైర్యాన్ని నివారించడానికి, అందరి మధ్య సయోధ్య పెంచడానికి కృషి చేశాడు. తన పూర్వపు ప్రతిస్పర్ధులనుండి కూడా ప్రశంసలు అందుకొన్నాడు. వందకు పైగా అవార్డులు, సత్కారాలతో వివిధ దేశాలు, సంస్థలు మండేలాను గౌరవించాయి. వాటిలో 1993లో లభించిన నోబెల్ శాంతి బహుమతిముఖ్యమైనది. స్వదేశంలో మండేలాను **మదిబా** అని వారి తెగకు సంబంధించిన గౌరవసూచకంతో మన్నిస్తారు.

మహాత్మాగాంధీ బోధించిన శాంతియుత విధానాలు, అహింస, శత్రువును సంస్కారయుతంగా ఎదుర్కొనే పద్ధతి తనకు ఎంతో స్ఫూర్తినిచ్చాయని మండేలా పెక్కుమార్లు చెప్పాడు. భారత దేశం మండేలాను 1990 లో 'భారత రత్న', జవహర్‌లాల్ నెహ్రూ అంతర్జాతీయ సయోధ్య బహుమతితోసత్కరించింది. భారత దేశం నుండి మండేలాకు ఎంతో సమర్ధన లభించింది. ప్రపంచవ్యాప్తంగా అణచివేతకు వ్యతిరేకంగా పోరాడే కోట్ల మంది ప్రజలకు మండేలా ఒక ప్రతీకగా మారారు. పశ్చిమ దేశాలు కూడా హక్కుల ఉద్యమ కారులైన అబ్రహం లింకన్, మార్టిన్ లూథర్‌కింగ్‌లతో సమానంగా ఆయన్ను గౌరవిస్తున్నాయి. హింసా మార్గంలో ప్రారంభించిన ఉద్యమాన్ని గాంధేయ మార్గంలోకి ఆయన మలచుకున్న తీరు ఆయనకు దక్షిణాఫ్రికా గాంధీగా పేరు తెచ్చింది. నోబెల్ శాంతి బహుమతితో అంతర్జాతీయ సమాజం ఆయన్ను గౌరవించుకోగా, 1990లో అత్యున్నత పౌర పురస్కారం భారతరత్న ఇచ్చి భారతీయ సమాజం తనను తాను గౌరవించుకుంది.మండేలా డిసెంబర్ 5, 2013 న మరణించారు. మండేలా మానవతకే స్ఫూర్తి ప్రదాతని రాష్ట్రపతి ప్రణబ్ ముఖర్జీ కొనియాడారు.దక్షిణాఫ్రికా మాజీ అధ్యక్షుడు నెల్సన్ మండేలా మృతికి గౌరవసూచకంగా కేంద్ర ప్రభుత్వం ఐదు రోజుల సంతాపదినాలు ప్రకటించింది.

G. Sree Kar M.Sc, B.Ed

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సర్వశిక్షాభియాన్-అందరూ చదవాలి, అందరూ ఎదగాలి.

Chapter -1

Heat

1. What would be the final temperature of a mixture of 50g of water at 20^0C temperature and 50g of water at 40^0C temperature? (AS1)

Solution :- Given m_1 = 50g T_1= 20^0C Final temperature , T= ?

m_2 = 50 g T_2 = 40^0C

Formula :- $T = \frac{m1T1+m2T2}{m1+m2}$

$T = \frac{50\ X\ 20+50\ X\ 40}{50+50} = \frac{1000+2000}{100} = \frac{3000}{100} = 30^0$C

2. Explain why dogs pant during hot summer days using the concept of evaporation? (AS1)

1. Dogs pants on hot days because they are trying to cool down just like we sweat on a hot days.
2. So, dogs pant to regulate their body temperature.

3. Why do we get dew on the surface of a cold soft drink bottle kept in open air? (AS1)

1. When a cold soft drink bottle kept in open air, bottle surface absorb the heat from the surrounding air.
2. So, outer surface of the molecules get cooled, thus the water droplets are formed.

4. Write the differences between evaporation and boiling? (AS1)

Evaporation takes place at any temperature, while boiling occurs at a definite temperature(100^0C).

5. Does the surrounding air become warm or cool when vapours phase of H_2O condenses? Explain?

The surrounds air becomes warm when vapour phase of H_2O condenses.

Explanation: - 1. Heat is transferred from vapour phase of H_2O to surrounding air.

2. So, The surrounds air becomes warm when vapour phase of H_2O condenses.

6. Answer these. (AS1)

a) How much energy is transferred when 1gm of boiling water at 100^0C condenses to water at 100^0C?

540 calories of heat energy is transferred when 1 gm of boiling water at 100^0 C condenses to water at 100^0 C.

b) How much energy is transferred when 1gm of boiling water at 100^0C cools to water at 0^0C?

1. The heat energy transferred when 1 gm of water at 100^0 C to become water at 0^0c on cooling is 100 calories.
2. Hence, (540+100) calories =640 calories of heat is transferred when 1 gm of boiling water at 100^0c cool water at 0^0C.

c) How much energy is transferred when 1gm of water at 0^0C freezes to ice at 0^0C?

1 gm of water at 0^0C releases 80 calories of heat energy when it freezes to ice at 0^0C.

d) How much energy is transferred when 1gm of steam at 100^0C turns to ice 0^0C?

1. The heat energy transferred when 1 gm of water at 100^0 C to become water at 0^0c on cooling is 100 calories.
2. Hence, (540+80+100) Calories =720 calories of heat energy is released when 1 gm of steam at 100^0C turns to ice at 0^0C.

7. Explain the procedure of finding specific heat of solid experimentally. (AS1)

Aim:- To find the specific heat of given solid.

Apparatus:- Calorimeter, thermometer, stirrer, water, steam heater, wooden box and lead shots.

Procedure:- 1. Let the mass of the calorimeter along with stirrer is ' m_1' gm.

2. One third of the volume of the calorimeter is filled with water and its mass is ' m_2' gm.
3. The temperature of the calorimeter is noted ($T_1{}^0$C).
4. The heated Lead pieces (m_3 gm and $T_2{}^0$C) are quickly transferred in to calorimeter, with minimum loss of heat.
5. Contents in the calorimeter are stirred and then resultant temperature ($T_3{}^0$C) is noted .
6. Let the specific heats of the calorimrter, led shots and water are S_c , S_l and S_w respectively.
7. By using the formula we calculate the specific heat of the given solid,

$$S_l = [m_1 S_c + (m_2 - m_1) S_w (T_3 - T_1)] / (m_3 - m_2) (T_2 - T_3)$$

8. Covert 20^0C into Kelvin scale. (AS1)

Temperature in Kelvin =273 + Temperature in Celsius degrees. =273+20 =293 K

9. Your friend is notable to differentiate between evaporation and boiling. What questions do you? ask to make him know the differences between evaporation and boiling? (AS2)

1. Is boiling temperature of the water is always 100^0C?
2. How wet clothes dry without heating?
3. Does boiling depend on the surface on the area of a liquid?
4. Does evaporation depend on the surface area of a liquid?

10. What happens to the water when wet clothes dry? (AS3)

When wet clothes are dried, the water in them is escaped as water vapour due to evaporation and mixes with the air.

11. Equal amounts of water are kept in a cap and in a dish. Which will evaporate faster? Why? (AS3)

1. Evaporation depends on the surface area.
2. Hence, the water kept in dish will evaporate faster than the cap.

12. Suggest an experiment to prove that rate of evaporation of liquid depends on its surface area and vapour already present in surrounding air. (AS3)

Aim:- To prove that rate of evaporation of liquid depends on its surface area.

Apparatus:- Two dishes of different surface area and water.

Procedure:- 1. Take a small quantity of water in two dishes separately.

2. Keep the dishes under the fan and switch on the fan.
3. After some time observe the quantity of water in both dishes.
4. It is proved that the dishes contain larger surface area of water is fastly evaporated.

13. Place a Pyrex funnel with its mouth-down in a sauce pan with full of water, in such a way that the stem tube of the funnel is above the water or pointing upward into air. Rest the edge of the bottom portion of the funnel on a nail or on a coin so that water can get under it. Place the pan on a stove and heat it till it begins to boil. Where do the bubbles form first? Why? Can you explain how a Geyser works using above experience? (AS4)

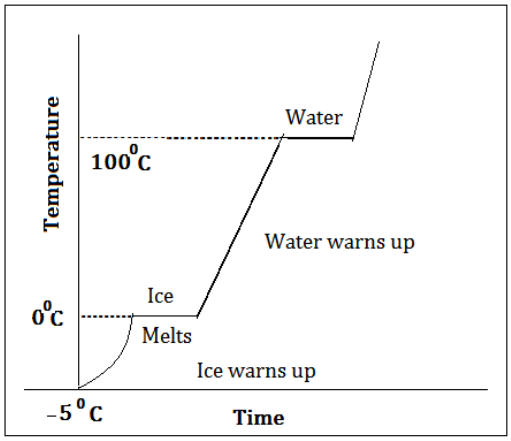
1. When a Pyrex funnel with its mouth-down in a in a sauce pan with full of water.
2. Rest the edge of the bottom portion of the funnel on a nail or on a coin so that water can get
3. Place the pan on a stove and heat it till it begins to boil. under it.
4. The bubbles of water come from the top of the funnel.

Working of Geyser:- 1. The Geyser works on the principle of electrical energy converted into heat
2. When heat energy increases, the inside pressure of Geyser is increases. energy.
3. So, the bubbles of water will come out from the top portion of the Geyser.

14. Collect the information about working of geyser and prepare a report. (AS4)

1. A geyser has inner heating element made up of Nichrome.
2. It acts as a thermostat unit to control the temperature by switching off the element, once the desired temperature has been reached.
3. The resistance of the wire restricts the current flow causing a pressure of electrons and potons and in turn creates a heat.

15. Assume that heat is being supplied continuously to the ice at -5^0C. You know that ice melts at 0^0C and boils at 100^0C. Continue the heating till it starts boiling. Note the temperature for every minute. Draw a graph between temperature and heat using the values you get. What do you understand from the graph? Write the conclusions. (AS5)



Conclusions: - 1.The temperature remains constant at 0^0C, till all the ice is converted in to water.

2. The temperature remains constant at 100^0C, until all the water is converted in to water.

16. How do you appreciate the role higher specific capacity value of water in stabilizing atmospheric? temperature during winter and summer seasons? (AS6)

1. The sun delivers a large amount of energy to the Earth daily.
2. The water masses on Earth, particularly the oceans, absorb this energy for maintaining a relatively constant temperature.
3. The oceans behave like heat "store houses" for the earth.
4. Therefore, oceans moderate the surrounding temperature near the equator during winter and summer season
5. So, I appreciate the role higher specific capacity value of water in stabilizing atmospheric temperature during winter and summer seasons.

17. Suppose that to 1 litre of water is heated for a certain time to rise and its temperature by 2^0C. If 2 liter of water for the same time, by how much will its temperature rises? (AS7)

Solution :- Given $m_1 = 1Kg$ $\Delta T_1 = 20C$

$m_2 = 2Kg$ $\Delta T_2 = ?$

Formula :- $\frac{m1}{m2} = \frac{\Delta T1}{\Delta T2} \rightarrow \frac{1}{2} = \frac{\Delta T2}{2} \rightarrow \Delta T_2 = 1^0C$

18. What role does specific heat capacity play in a watermelon to keep it cool for long time after removing it from a fridge on a hot day? (AS7)

1. Water melon brought out from the refrigerator retains its coolness for a longer time than any other fruit.
2. Because it contains large percentage of water. (Water has greater specific heat).

19. If you are chilly outside the shower stall, why do you feel warm after the bath if you stay in bathroom? (AS7)

1. In the bathroom, the number of vapour molecules per unit volume is greater than number of vapour molecules per unit volume outside the room.
2. When you try to dry yourself with a towel, the vapour molecules surrounding you condense on your skin and this condensation makes you feel warm.

చెట్టును కసిగా నరికినా మౌనంగా సహిస్తుంది. కొత్త చిగురు మహా సమాధానం

While you cut it out bluntly trees bears it, with due patience- New sprouts shoot and shout, as a fitting reply.

Chapter –3

Reflection of light on different surfaces

1. State the laws of reflection of light. (AS1)

Laws of Reflection of Light: – 1. Light travels in a straight line motion.

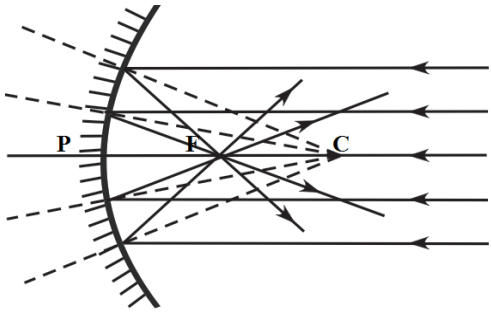
2. When light gets reflected from a surface, the angle of incidence is equal to the angle of reflection.

3. The incident ray, reflected ray and normal are lies in a same surface.

2. Why concave and convex mirrors are called spherical mirrors? (AS1)

Convex and concave mirrors contain curved surfaces. So, they are called spherical mirrors.

3. How do you find the focal length of a concave mirror? (AS1)



1. The reflected rays on the concave mirror are converging at a point.
2. This point is called Focus or focal point (F) of the concave mirror.
3. The distance between the pole and focal point is called its focal length.

4. Where will the image form when we place an object, on the principal axis of a concave mirror at a point between focus and centre of curvature? (AS1)

When we place an object, on the principal axis of a concave mirror at a point between focus and centre of curvature the image is formed on beyond the center of curvature.

6. State the differences between convex and concave mirrors. (AS1)

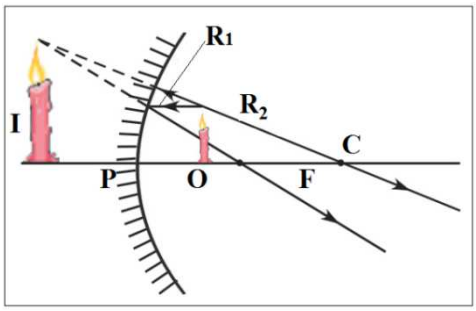
Concave mirror	Convex mirror
1.The surface of the concave mirror is curved In wards.	1.The surface of the convex mirror is bulged Out wards.
2. It reflected real and inverted images.	2. It reflected virtual images.
3. Focal point is formed infront of the mirror.	3.Focal point is formed behind the mirror.

7. Distinguish between real and virtual image? (AS1)

Real image	Virtual image
1. Real image can be caught on a screen.	1. Virtual image cannot be caught on a screen.
2. These are formed due to converge of rays.	2. These are formed due to diverging of rays.
3. These are always inverted.	3. These are always erect.

8. How do you get a virtual image using a concave mirror? (AS1)

If the object is placed in between the pole and focal point on a concave mirror then virtual images are formed.



9. What do you know about the terms given below related to the spherical mirrors? (AS1)

a) Pole b) Centre of curvature c) Focus d) Radius of curvature e) Focal length f) Principal axis g) Object distance h) Image distance i) Magnification.

a) Pole: – The midpoint (Geometrical centre) of the mirror is called pole (P) of the mirror.

b) Centre of curvature: – All normals of concave mirror will converge towards a point. This point is called centre of curvature(C) of the mirror.

c) Focus: – All the reflected ray of concave mirror is intersecting at one point on the principle axis is called focus or focal point (F).

d) Radius of curvature: – The distance between Pole and Center of curvature is radius of curvature **(R)** of the mirror.

e) Focal length: – The distance between pole and focal point of a mirror is called focal length (f).

f) Principal axis: – The horizontal line which passes through the centre of curvature and pole is called central axis or principal axis of the mirror.

g) Object distance: – The distance between the pole of a mirror and object is called object distance.

h) Image distance: – The distance between the pole of a mirror and image is called image distance.

i) Magnification: – $m = \frac{\text{size of image (height)}}{\text{size of object (height)}}$ (or) $m = -\frac{\text{image distance from mirror (v)}}{\text{object distance from mirror (u)}}$

10. Write the rules mentioned for sign convention. (AS1)

Rules mentioned for sign convention: – 1. All distances should be measured from the pole.
2. The distances measured in the direction of incident light, to be taken as positive.
3. The distances measured in the opposite direction of incident light, to be taken as negative.

11. The magnification of a plane mirror is +1. What you are observing from this value?

The magnification of a plane mirror is +1 means both object and images are lie on same plane.

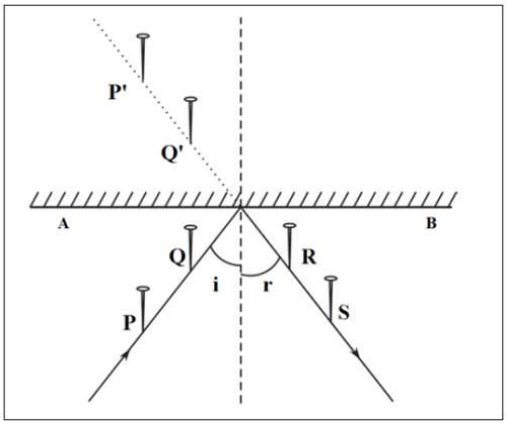
12. Imagine that spherical mirrors are not known to human being, guess the consequences. (AS2)

1. It would be unsafe to drive vehicles, especially in the night.
2. Dentist cannot analyze the problems in our teeth.
3. Many large telescopes to observe the universe will not possible.

13. By observing steel vessels and different images in them; Surya, a third class student asked some questions his elder sister Vidya. What may be those questions? (AS2)

1. Why our image is reduced in some steel vessels?
2. Why our image is enlarged in some steel vessels?
3. Why we are not observing the clear image in a steel vessel like a mirror?

14. How do you verify the 1st law of reflection of light with an experiment? (AS3)



Aim:- Verification of first law of reflection of light.

Required material:- Mirror strip, drawing board, white paper, pins, clamps scale and pencil.

Procedure:- 1. Take a drawing board and fix a white paper on it with the help of clamps.

2. Draw a straight line PQ making certain angle and find its reflection P^I and Q^I.
3. Join R, S and O as shown in the figure. Measure the angle between RS and ON.
4. You will find that angle of incidence = angle of reflection.
5. Hence first law is verified.

15. How do you verify the 2nd law of reflection of light with an experiment? (AS3)

Aim:-Verification of second law of reflection of light.

Required material:- mirror strip, drawing board, white paper, pins, clamps scale and pencil.

Procedure:- 1. Take a drawing board and fix a white paper on it with the help of clamps.

2. Draw a straight line PQ making certain angle and find its reflection P^I and Q^I.
3. Join R, S and O as shown in the figure.
4. We will find the incident ray PO, The reflected ray RS and normal ON are lying in the same surface.
5. Hence second law is verified.

Note: - Draw the same diagram of question number 14 .

16. What do you infer from the experiment which you did with concave mirror and measured the distance of object and distance of image? (AS3)

Position of the candle (object)	Position of the image	Bigger/smaller than object	Inverted or erected	Real or virtual
Between mirror & F	Behind the mirror	Bigger	Erected	Virtual
On focal point	At infinity	Bigger	Inverted	Real
Between F and C	Beyond C	Bigger	Inverted	Real
On centre of curvature	On C	Same size	Inverted	Real
Beyond C	Between F and C	Smaller	Inverted	Real

17. Find the plane of the reflection experimentally for the incident ray which passes through the heads of the pins pierced in front of mirror. (AS3)

1. Take a drawing board and fix a white paper on it with the help of clamps.
2. Draw a straight line PQ making certain angle and find its reflection P^I and Q^I.
3. Join R, S and O as shown in the figure.
4. We will find the incident ray , the reflected ray and normal are lying in the same surface.

Note: – Draw the same diagram of question number 14 .

18. Collect the information about the history of spherical mirrors in human civilization. Display in your class room. (AS4)

1. One of the famous examples is from the Greek Archimedes, who burnt ships with parabolic
2. Metal coated glass mirror, is invented in Sidon in 1st century A.D. mirrors.
3. Bronze mirror was manufactured from around 200 B.C.
4. Mirrors made from mixtures are also been produced in China and India.

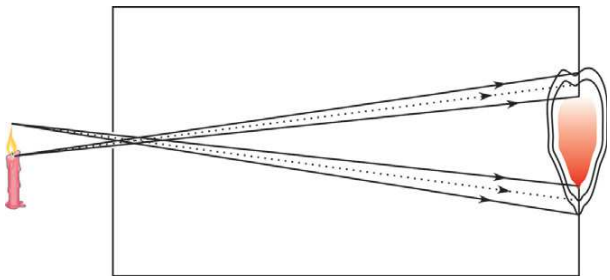
19. Think about the object which acts as a concave or convex mirror in your surroundings. Make a table and display in your class room (AS4)

Concave	Convex
1. Spoon bulged inwards.	1. Spoon bulged outwards.
2. Inner surface of a steel basin.	2. Outer surface of a steel basin.
3. Inner surface of a cooking vessel.	3. Outer surface of a cooking vessel.

20. How will our image in concave and convex mirrors? Collect photographs and display in your class room. (AS4)

1. In concave mirror our image is thin.
2. In convex mirror our image is bulged out.

21. Draw and explain the process of formation of image with a pinhole camera? (AS5)

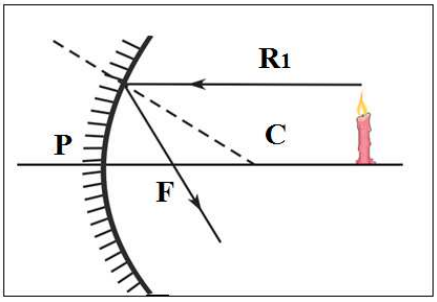


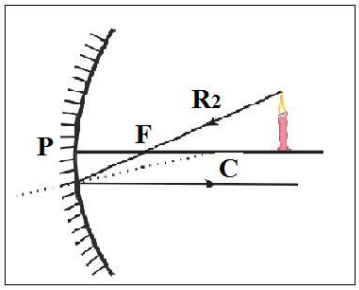
Formation of image in pinhole camera: – 1. The light rays coming from the top of the candle flame fall at different points on the screen.

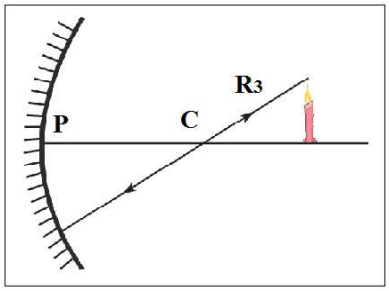
2. Similarly the rays coming from bottom of the candle flame also fall at different points on the screen.

3. Thus we get blurred image on the screen.

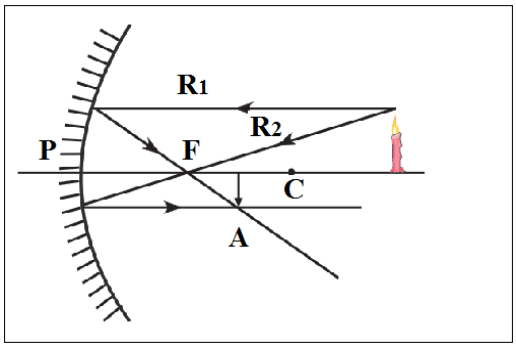
22. Draw suitable rays by which we can guess the position of the image formed by a concave mirror. (AS5)





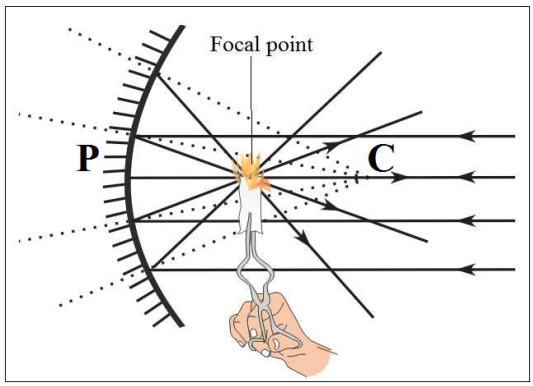


23. Show the formation of image with a ray diagram, when an object is placed on the principal axis of a concave mirror away from the centre of curvature. (AS5)

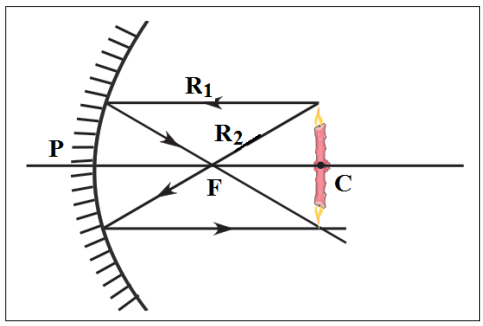


24. Make a solar heater/cooker and explain the process of making. (AS5)

1. Make a wooden/ iron frame in in the shape of TV dish.
2. Cut the acrylic mirror sheets in to 8 or 12 pieces in the shape of isosceles triangles.
3. Stick the triangle mirrors to the dish as shown in the figure.
4. Your solar heater/cooker is ready.



25. To form the image on the object itself, how should we place the object in front of a concave mirror? Explain with a ray diagram. (AS5)



1. The object is placed on the centre of curvature of concave mirror.
2. The reflected rays are converse at centre of curvature only.
3. So, a real and inverted image with size equal to the size of the object.

26. How do you appreciate the role of spherical mirrors in our daily life? (AS6)

1. Spherical mirrors are used as rare-view mirror in the vehicles.
2. Dentists are also used the spherical mirrors.
3. Spherical mirrors are used in many large telescopes to observe the universe.
4. So, I appreciate spherical mirrors in our daily life.

27. How do you appreciate the use of reflection of light by a concave mirror in making of TV antenna dishes? (AS6)

1. A concave mirror can converge the reflected rays to its focal points.
2. Because by this property of a concave mirror, the shape of TV dish antenna is designed.
3. Hence, I really appreciate the use of reflection of light by a concave mirror in making of TV antenna dishes.

28. Have you ever observed the images of the sky in rain water pools on earth? Explain the reflection of light in this context? (AS6)

1. The surface of rain water in pools act as a plane mirror.
2. So we can observe the virtual image of sky due to reflection of light from surface of rain pool.

29. Discuss the merits and demerits of using mirrors in building elevating? (AS7)

Merits: -
1. They absorb heat energy.
2. They make the building attractive.
3. They are used to cool inside the building.

Demerits: -
1. Some mirrors used in buildings are easily breakable.
2. Birds confused because of the reflection of mirrors in building elevation.
3. It causes disturbance at night time because reflection confuses the vehicles.

30. Why do we prefer a convex mirror as a rear-view mirror in the vehicles? (AS7)

1. Convex mirror always produce an erect and virtual image of the behind vehicle in the small
2. So, we prefer a convex mirror as a rear-view mirror in the vehicles. mirror.

Chapter 5

Refraction at Plane Surface

1. Why is it difficult to shoot a fish swimming in water? (AS1)

1. It is very difficult to shoot a fish swimming in water.
2. Because its position appears to be shifted up from its original position due to reflection.

2. The speed of the light in a diamond is 1, 24, 000 km/s. Find the refractive index of diamond if the speed of light in air is 3, 00,000 km/s. (AS1) (Ans: 2.42)

Given: - Speed of light in a Diamond = 1, 24, 000 km/s

Speed of light in air = 3, 00,000 km/s.

Refractive index of a Diamond = $\frac{Speed\ of\ light\ in\ air}{speed\ of\ light\ in\ a\ dimond} = \frac{3,00,000}{1,24,000} = 2.419 = 2.42$

3. Refractive index of glass relative to water is $\frac{9}{8}$. What is the refractive index of water relative to glass? (AS1) (Ans: $\frac{8}{9}$)

Given :- Refractive index of glass relative to water is = $\frac{9}{8} = \frac{Speed\ of\ light\ in\ water}{Speed\ of\ light\ in\ air}$

Refractive index of water relative to glass = $\frac{Speed\ of\ light\ in\ air}{Speed\ of\ light\ in\ water} = \frac{8}{9}$

4. The absolute refractive index of water is $\frac{4}{3}$. What is the critical angle of it? (AS1) (Ans: 84.5^0)

Given :- The absolute refractive index of water = $\frac{4}{3}$

$\frac{1}{\sin C} = \frac{4}{3} \rightarrow \text{Sin C} = \frac{3}{4} \rightarrow \text{Sin C} = 0.75 \rightarrow \text{Sin C} = \sin 84.5^o \rightarrow C = 84.5^0$

5. Determine the refractive index of benzene if the critical angle of it is 42^0.(AS1) (Ans: 1.51)

Given :- The critical angle of Benzene = 42^0

Refractive index of Benzene = $\frac{1}{Sin\ C} = \frac{1}{Sin\ 42} = \frac{1}{0.6691} = \frac{10000}{6691} = 1.51$

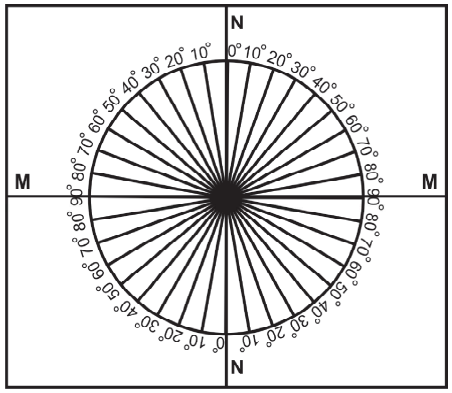
6. Explain the formation of mirage ?(AS1)

Mirage :- Mirage is an optical illusion where it appears that water is collected on the road at a distant place but when we get there, we don't find any water.

Formation :- 1. During the hot summer day, air just above the road surface is very hot and the air at higher altitudes is cool.

2. Light travels faster through the thinner hot air than through, the denser cool air above it.
3. When light falls from tall object such as tree or from the sky passes through a medium just above the road.
4. Due to the refraction of light ,we fell the illusion of water being present on road.
5. This is called a mirage.

7. How do you verify experimentally that $\frac{Sin\ i}{Sin\ r}$ is constant ? (AS1)



Aim: - To verify that $\frac{Sin\ i}{Sin\ r}$ is a constant.

Materials required:- A plank, white chart, protractor, scale, small black painted plank, a semi circular glass disc of thickness nearly 2cm pencil and laser light.

Procedure :- 1. Make a chart as shown in the figure.

2. Place a semi-circle glass disc so that its diameter coincides with the line "MM"
3. Send a laser light along a line which makes 15^0 with "NN".
4. Measure its corresponding angle of refraction by observing light coming from outside of the glass slab.
5. Repeat this experiment with various values of angle of incidence, refraction and noted below.

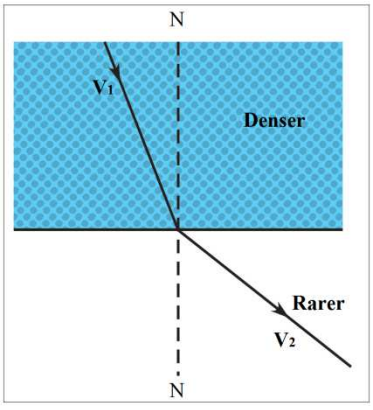
S.No	i	r	Sin i	Sin r	$\frac{Sin\ i}{Sin\ r}$

6. From the above table we observe that $\frac{Sin\ i}{Sin\ r}$ is a constant.

8. Explain the phenomenon of total internal reflection with one or two activities?(AS1)

1. Take a cylindrical transparent vessel and place a coin at the bottom of the vessel.
2. Now pour water until you get the image of the coin on the water surface.
3. Formation of the image of the coin is due to total internal reflection.

9. How do you verify experimentally that the angle o refraction is more than angle of incidence when light rays travel from denser to rarer medium ? (AS1)



1. Consider that a light travels from medium-1 with speed V_1 to medium-2 with speed V_2 as shown in the figure.
2. Here $V_2 < V_1$ means medium-1 is denser medium and medium-2 is rarer medium.
3. When light travels from denser medium to rarer medium the angle of incident is less than the angle refraction.
4. This means angle o refraction is more than angle of incident when light travels from denser medium to rarer medium.

10. Take a bright metal ball and make it black with soot in a candle flame. Immerse it in water. How does it appear and why? (Make hypothesis and do the above experiment). (AS2)

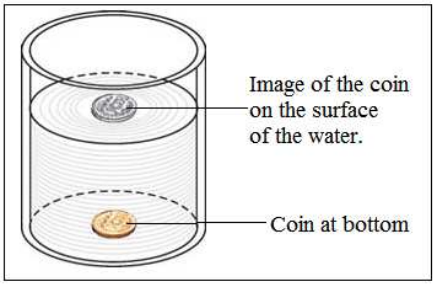
1. The metallic ball appeared to be raised up in the water.
2. The path of the ray changes its direction at the interface, separating the two media i.e air and water.

11. Take a glass vessel and pour some glycerin into vessel and next pour water up to the brim. Take a quartz glass rod. Keep it in the vessel. Observe glass rod by the sides of glass vessel. *What changes do you notice? * What could be the reasons for these changes? (AS2)

1. We cannot see the glass rod in glycerin, but we can see the rod in water.
2. We also observe a clear image of glass rod in water.

Reason: - Glycerin and glass have same refractive index. So we are unable to see the glass rod in glycerin.

12. Do activity-7 again. How can you find critical angle of water? Explain your steps briefly. (AS3)



1. You might have observed a coin kept at the bottom of a vessel filled with water appears to be raised.
2. The refractive index of water is 1.33
3. So critical angle of water, $\text{Sin C} = \frac{1}{Refractive\ index\ (n)} = \frac{1}{1.33}$

   $\text{Sin C} = 0.7518$

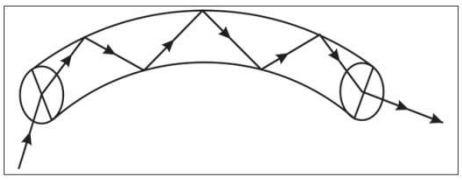
   $\text{Sin C} = \text{Sin } 48.7^0 \rightarrow \text{C} = 48.7^0$
4. The critical angle of water = 48.7^o

13. Collect the values of refractive index of the following media. (AS4)

Water, coconut oil, flint glass, crown glass, diamond, benzene and hydrogen gas.

S.No	Material Medium	Refractive index
1	Water	1.33
2	Coconut oil	1.445
3	Flint glass	1.65
4	Crown glass	1.52
5	Diamond	2.42
6	Benzene	1.50
7	Hydrigen	------

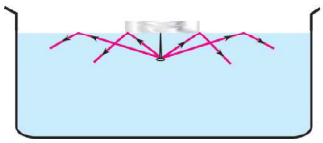
14. Collect information on working of optical fibers. Prepare a report about various uses of optical fibres in our daily life. (AS4)



Optical fibers: - 1. Fibers works on the principle of total internal reflection.

2. Fiber is made up of plastic or glass and its diameter is one micro meter (10^{-6} m).
3. Optical fibers are used to test the intestines of a human body.
4. Fiber optics are used to transmit the communication signals through light pipes.

15. Take a thin thermocol sheet. Cut it in circular discs of different radii like 2cm, 3cm, 4cm, 4.5cm, 5cm etc and mark centers with sketch pen. Now take needles of length nearly 6cm. Pin a needle to each disc at its centre vertically. Take water in a large opaque tray and place the disc with 2cm radius in such a way that the needle must be inside the water as shown in figure. Now try to view the free end (head) of the needle from surface of the water.



a). Did you able to see the head of the needle?

Now do the same with other discs of different radii. Try to see the head of the needle, each time.

Note: the position of your eye and the position of the disc on water surface should not be changed while repeating the activity with other discs.

b). At what maximum radius of disc, did you not able to see the free end of the needle?

c). Why didn't you able to view the head of the nail for certain radii of the discs?

d). Does this activity help you to find the critical angle of the medium (water)?

e). Draw a diagram to show the passage of light ray from the head of the nail in different situations. (AS4)

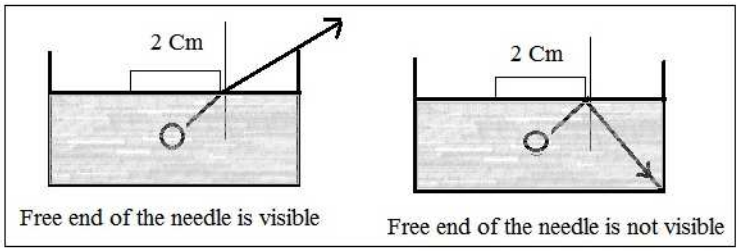
1. Yes, we can see the head of the needle.
2. At radius of 6 cm, we cannot see the free end of the needle.
3. Because the light ray coming from the object undergoing total internal reflection by touching the surface of disc.
4. Yes, this activity helps us to find the critical angle of the medium (water).

$$\text{Sin C} = \frac{Refrective\ index\ of\ air\ (n2)}{Refrective\ index\ of\ water (n1)} = \frac{1.003}{1.33} = 0.7521$$

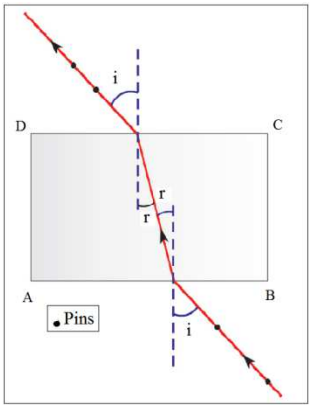
$$\text{Sin C} = \text{Sin } 48.7^0$$

$$\text{Critical angle, C} = 48.7^0$$

5.

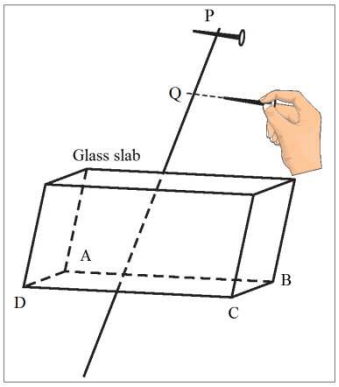


16. Explain the refraction of light through the glass slab with a neat ray diagram. (AS5)



1. Place a piece of chart on a plank and Clamp it.
2. Place a glass slab in the middle of the paper. Draw border line along the edges of the slab by using a pencil.
3. Name the vertices of the rectangle as A, B, C and D.
4. Make the arrangement as shown in the figure.
5. The refraction of light through the glass slab is as shown in the figure.
6. From the figure we noticed that the incident ray and emergent ray are parallel.

17. Place an object on the table. Look at the object through the transparent glass slab. You will observe that it will appear closer to you. Draw a ray diagram to show passage of light ray in this situation. (AS5)



18. What is the reason behind the shining of diamond and how do you appreciate it? (AS6)

1. Total internal reflection is the main reason behind the shining of diamond.
2. Diamond has high refractive index (2.41) and very low critical angle (24.4^0).
3. These are responsible for total internal reflection to take place in it.
4. So, I appreciate the diamond for shining.

19. How do you appreciate the role of Fermat principle in drawing a ray diagram? (AS6)

1. Fermat principle shows that light always takes the path of least amount of time.
2. This principle enables us to draw the ray diagram to explain the phenomena of light.
3. This principle also enables us to draw the ray diagram of reflection of light.
4. So, we appreciate the role of Fermat principle in drawing a ray diagram.

20. A light ray is incident on air-liquid interface at $45^0$and is refracted at 30^0. What is the refractive index of the liquid? For what angle of incidence will the angle between reflected ray and refracted ray be 90^0? (AS7) (Ans: 1.414, 54.7^0)

Given: - The angle of incidence, i = 45^0

The angle of refraction, r = 30^0

Refractive index of a liquid (n) = $\frac{\sin i}{Sin\, r} = \frac{Sin\, 45}{Sin\, 30} = \frac{\frac{1}{\sqrt{2}}}{\frac{1}{2}} = \frac{1}{\sqrt{2}} \times \frac{2}{1} = \sqrt{2} = 1.414$

The refractive index of a liquid is 1.414

We know angle of refraction (r) =90- Angle of incident

Refractive index (n) = $\frac{\sin i}{Sin\, r} \rightarrow 1.414 = \frac{\sin i}{Sin\,(90-i)} \rightarrow \frac{Sin\, i}{Cos\, i} = 1.414 \rightarrow \tan i = 1.414$

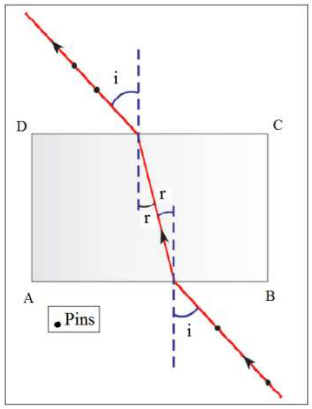
$\rightarrow \tan i = \tan 54.7^0 \rightarrow \angle i = 54.7^0$

Critical angle = 54.7^0

21. Explain why a test tube immersed at a certain angle in a tumbler of water appears to have a mirror surface for a certain viewing position? (AS7)

1. When the glass tube is immersed in the water it appears to have a mirror surface.
2. Because they get total internally reflected.
3. So they appear to come from the surface of the tube itself.

22. What is the angle of deviation produced by the glass slab? Explain with ray diagram. (AS7)



1. Place a piece of chart on a plank and Clamp it.
2. Place a glass slab in the middle of the paper. Draw border line along the edges of the slab by using a pencil.
3. Name the vertices of the rectangle as A, B, C and D.
4. Make the arrangement as shown in the figure.
5. The refraction of light through the glass slab is as shown in the figure.
6. From the figure we noticed that the incident ray and emergent ray are parallel.

23. In what cases a light ray does not deviate at interface of two media? (AS7)

Alight ray does not deviate at interface of two media when it is incident normally at a point on the interface of two media.

24. A ray of light travels from an optically denser to rarer medium. The critical angle of the two media is 'c'. What is the maximum possible deviation of the ray? (AS7) (Ans:Π-2c)

Given: - The critical angle = C

The maximum angle of deviation of the ray = Π -(C+C) = Π -2C

25. When we sit at camp fire, objects beyond the fire seen swaying. Give the reason for it. (AS7)

1. When we sit at camp fire, objects beyond the fire seen swaying.
2. This happens due to refraction of light
3. The rays of light get reflected when thy passes through hot air to cold air.
4. So we observe the objects beyond the fire seen sawing.

26. Why do stars appear twinkling? (AS7)

Stars appear twinkling due to multiple refraction at different layers of air of different densities; the light undergoes all the way to reach our eye.

27. Why does a diamond shine more than a glass piece cut to the same shape? (AS7)

1. Diamond exhibits the property of total internal reflection due to its high refractive index and low critical angle.
2. So, diamond shine more than a glass piece cut to the same shape.

BOOK BINDER BECAME AN EXPERIMENTAL PHYICIST

Michael Faraday (1791–1867)

Michael Faraday was an experimental physicist. He had no formal education. He came from a poor family. His father was a brick layer. He learned the formal education in the lap his mother. He worked in a book-binding shop during his early years. He used to read books that came for binding. This way Faraday developed his interest in science. He got an opportunity to listen to some public lectures by Humphrey Davy of Royal Institute. He made careful notes of Davy's lectures and sent them to Davy. Soon he was made an assistant in Davy's laboratory at the Royal Institute. Faraday made several path-breaking discoveries that include electromagnetic induction and the laws of electrolysis. Several universities conferred on him the honorary degrees but he turned down such honours. Faraday loved his science work more than any honour.

బడి పై వాలే సీతాకోక చిలుకలు పిల్లలు-మకరంధం విజ్ఞానం.

Children flocking butterflies on school precincts – Knowledge, their, finest nectar.

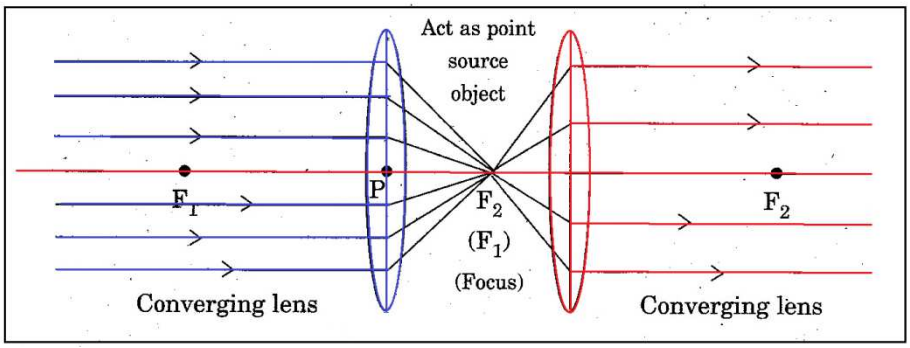
Chapter 6

Refraction at Curved Surface

1. A man wants to get a picture of a zebra. He photographed a white donkey after fitting a glass, with black stripes, on to the lens of his camera. What photo will he get? Explain. (AS1)

1. He will get an image of white donkey because every part of lens forms an image.
2. So, if we cover the lens with strips still it forms a complete image.
3. However, the intensity of the image will be reduced.

2. Two converging lenses are to be placed in the path of parallel rays so that the rays remain parallel after passing through both lenses. How should the lenses be arranged? Explain with a neat ray diagram. (AS1)



1. Arrange the two conversing lenses are to be placed in the path of parallel rays in such a way that they should have common focal point between them.
2. The parallel rays of the first lens form a point source at the focal point.
3. Next the light rays travel in all directions and falls on the second lens and get refracted.
4. The refracted rays also travel parallel to each other and also to the principle axis.
5. Thus, forms a parallel beam of light rays.

3. The focal length of a converging lens is 20cm. An object is 60cm from the lens. Where will the image be formed and what kind of image is it? (AS1)

Given: - Focal length, f = 20 Cm

Object distance, u = – 60 Cm (In front of lens take as – ve sign)

Image distance, v =?

Formula :- $\frac{1}{f}=\frac{1}{u}+\frac{1}{v} \Rightarrow \frac{1}{v}=\frac{1}{f}+\frac{1}{u} \Rightarrow \frac{1}{v}=\frac{1}{20}+\frac{1}{-60} \Rightarrow \frac{1}{v}=\frac{1}{20}-\frac{1}{60} \Rightarrow \frac{1}{v}=\frac{3-1}{60} \Rightarrow \frac{1}{v}=\frac{2}{60} \Rightarrow$ v =30 cm

∴ A real, diminished, inverted image formed at 30cm from the lens.

Linear Magnification, m $=\frac{v}{u}=\frac{30}{-60}=\frac{-30}{60}=\frac{-1}{2}$

Since m is negative, the image is real and inverted.

4. A double convex lens has two surfaces of equeal radii 'R' and refractive index n = 1.5. Find the focal length 'f'. (AS1)

Given:- Refractive index = 1.5

Let R_1 =R and R_2 = –R

Lens makers formula is $\frac{1}{f} = (n-1)\left[\frac{1}{R1} - \frac{1}{R2}\right]$

$= (1.5-1)\left(\frac{1}{R} - \frac{1}{-R}\right)$

$= (1.5-1)\left(\frac{1}{R} + \frac{1}{R}\right)$

$= 0.5\left(\frac{1+1}{R}\right)$

$= 0.5 \times \frac{2}{R}$

$\frac{1}{f} = \frac{1}{R}$

$\therefore f = R$

$\therefore$ The focal length is equeal to radiu of curvature.

5. Write the lens makers formula and explain the terms in it? (AS1)

Lens makers formula is $\frac{1}{f} = (n-1)\left[\frac{1}{R1} - \frac{1}{R2}\right]$

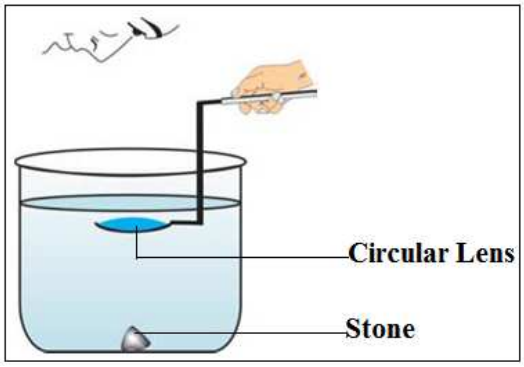
Here f = Focal length

R_1 and R_2 are radii of curvature.

n = Refractive index.

6. How do you verify experimentally that the focal length of a convex lens is increased when it is kept in water? (AS1)

1. The arrangements are shown as shown in the figure.
2. Set the distance between stone and lens that is equeal to less than the focal length of the lens.
3. We can see the image of the stone.
4. Now increase the distance between lens and stone until we cannot view the image of the stone.
5. This shows that the focal length of lens has increased in water.



7. How do you find the focal length of the lens experimentally? (AS1)

1. Take the lens on v-type stand and keep it on a table such that it focuses towards the distant object.
2. A white coated screen is placed on the other side of the lens and gets the clear image of the object.
3. At this position measure the distance between the lens and the screen which is equeal to the focal length of the lens.

i.e. $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

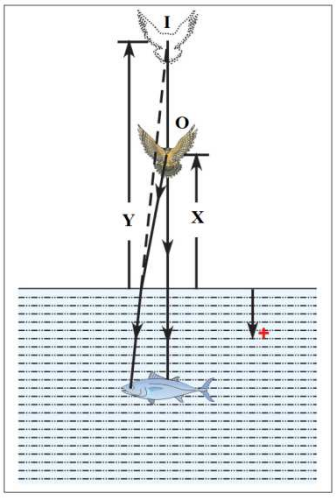
8. Harsha tells Siddhu that the double convex lens behaves like a convergent lens. But Siddhu knows that Harsha's assertion is wrong and corrected Harsha by asking some questions. What are the questions asked by Siddhu? (AS2)

1. What is the convergent lens?
2. Is there a lens which is called as a convergent lens other than double convex lens?
3. Sindhu corrected Harsha's assertion as: "A double convex lens is also known as convergent lens"

9. Assertion (A): A person standing on the land appears taller than his actual height to a fish inside a pond. (AS2)

Reason (R):- Light bends away from the normal as it enters air from water.

Which of the following is correct? Explain.



a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true and R is not the correct explanation of A.

c) A is true but R is false. d) Both A and R are false.

e) A is false but R is true.

Both A and R are true and R is the correct explanation of A.

Explanation: - 1. Let the actual height of the person be 'x' feet.

2. $\frac{Refractive\ index\ of\ air}{refractive\ index\ of\ water} = \frac{Actual\ height\ of\ the\ man}{Apparent\ height\ of\ the\ man}$

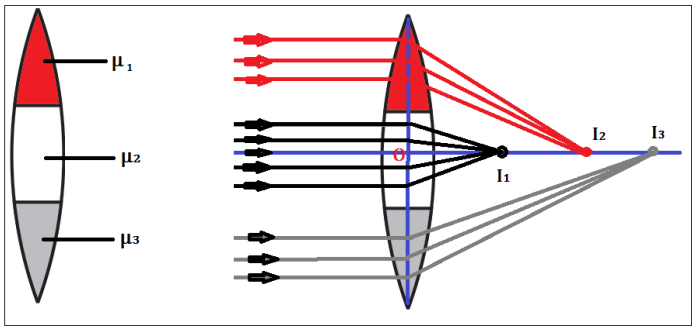
3. $\frac{1}{1.33} = \frac{x}{Apparent\ height\ of\ the\ man}$

4. Apparent height of the man = 1.33X

= 1.33 times of the actual height of the person.

5. Hence the standing on the land appears taller than his actual height to a fish inside a pond.

10. A convex lens is made up of three different materials as shown in the figure. How many of images does it forms? (AS2)

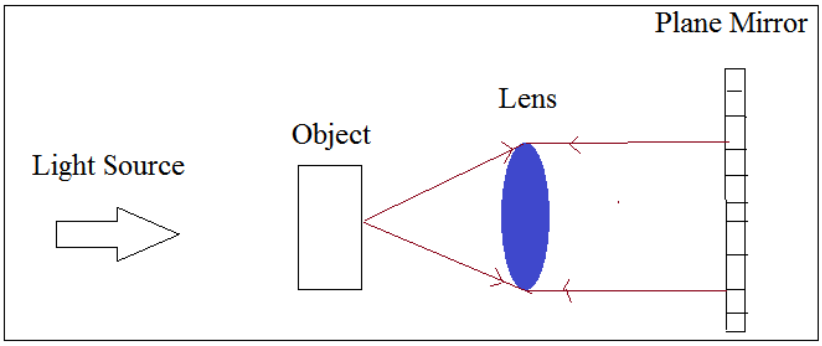


1. A convex lens is made up of three different materials and its refractive indexes are μ_1 ,μ_2 and μ_3 respectively.
2. They form three different images for a same object at their three different foci as shown in the figure.

11. Can virtual image be photographed by a camera? (AS2)

Yes, a virtual image can be photographed by a camera.

12. You have a lens. Suggest an experiment to find out the focal length of the lens. (AS3)

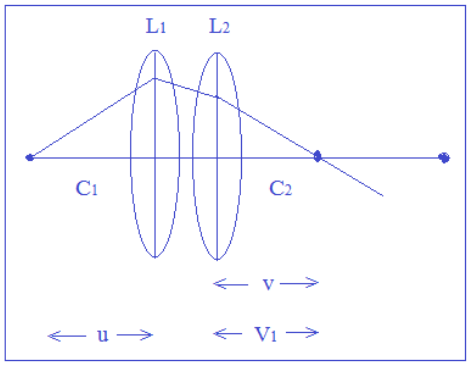


1. Place the lens in a lens holder on the bench.
2. Position the wire gauge, object, a lamp and a plane mirror as shown in the figure.
3. Move the lens backwards or frontwards in relation to the object until you catch a clear image on the screen.
4. Calculate the distance between the lens and object. It is equeal to focal length of the lens.

13. Let us assume a system that consists two lenses with focal length f_1 and f_2 respectively. How do you find the focal length of the system experimentally, when (AS3)

i) Two lenses are touching each other

ii) They are separated by a distance'd' with common optical axis.

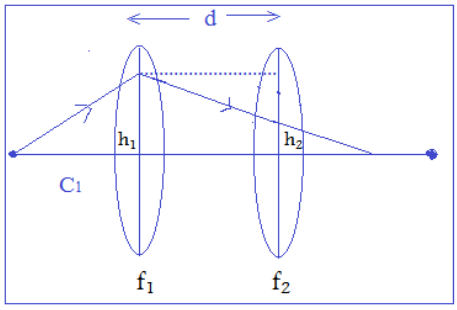


i) Focal lens of combination of two lenses are touching each other:–

1. We know the lens formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$
2. For the two lenses, we have $\frac{1}{f1} = \frac{1}{v1} - \frac{1}{u}$ ------ (1)

   $\frac{1}{f2} = \frac{1}{V} - \frac{1}{v1}$ ----- (2)
3. Adding equation (1) and (2), we have $\frac{1}{f1} + \frac{1}{f2} = \frac{1}{v1} - \frac{1}{u} + \frac{1}{V} - \frac{1}{v1}$

   $\frac{1}{f1} + \frac{1}{f2} = \frac{1}{V} - \frac{1}{u}$ .Here f is the equivalent focal length of the combination.
4. Thus $\frac{1}{F} = \frac{1}{f1} + \frac{1}{f2}$



ii) Focal lens of combination of two lenses are touching each other:–

1. When two lens are separated by a distance'd' and its focal lengths are f_1 and f_2 .
2. Then focal length, $\frac{1}{F} = \frac{1}{f1} + \frac{1}{f2} - \frac{d}{f1f2}$

14. Collect the information about the lenses available in an optical shop. Find out how the focal length of a lens may be determined by the given 'power' of the lens. (AS4)

1. The lenses available in the optical shop is below,

   Glass, concave lens, convex lens photo chromic lenses, single vision lenses, sport glasses, occupational lenses etc.

2. The focal length of a lens is determined by using the formula, Power (D) = $\frac{1}{f}$.

3. Here f is the focal length of a lens.

Power of lens in diopters	Type of lens	Focal length
0.25	Convex	400 cm
0.5	Convex	200 cm
-2	Concave	50 cm
-0.5	Concave	-100 cm
1	Convex	100 cm
-0.25	Concave	-400 cm

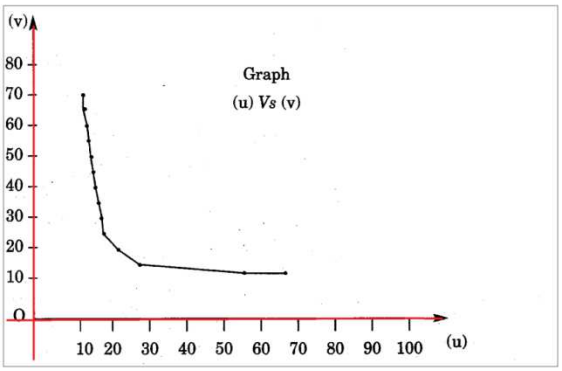
15. Collect the information about lenses used by Galileo in his telescope? (AS4)

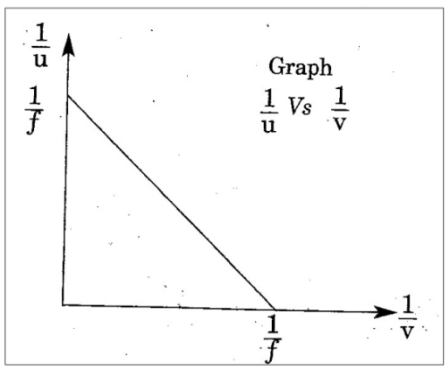
1. Galilean telescope has one convex lens and one concave lens.
2. The concave lens serves as the ocular lens or the eyepiece, while the convex lens serves as the object.
3. The lens are situated on either side of a tube such that focal point of the ocular lens is same as the focal point for the objective lens.

16. Use the data obtained by activity-2 in table-1 of this lesson and draw the graphs of u vs. v and $\frac{1}{u}$ vs. $\frac{1}{v}$. (AS5)

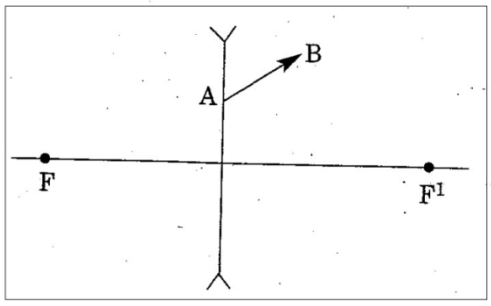
Table

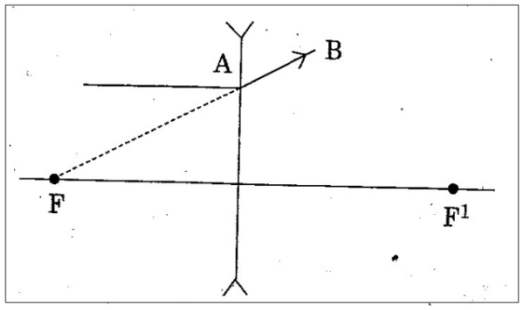
V	70	65	60	55	50	45	40	35	30	25	20	15	12	11
u	11	11.5	12	12.5	13	13.5	14	14.5	15	16.5	20	25	50	60



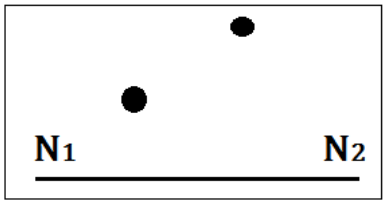


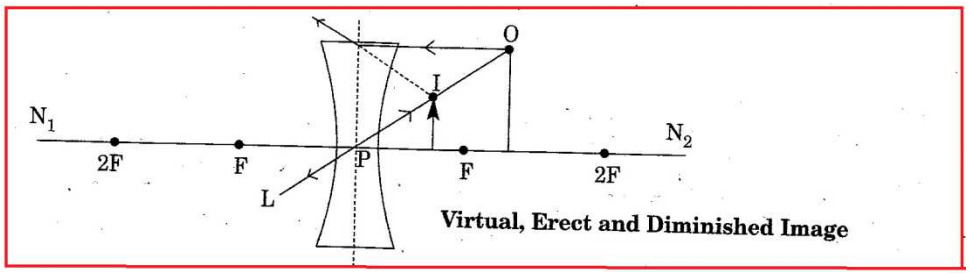
17. Figure Q-13 shows ray AB that has passed through a divergent lens. Construct the path of the ray up to the lens if the position of its foci is known. (AS5)

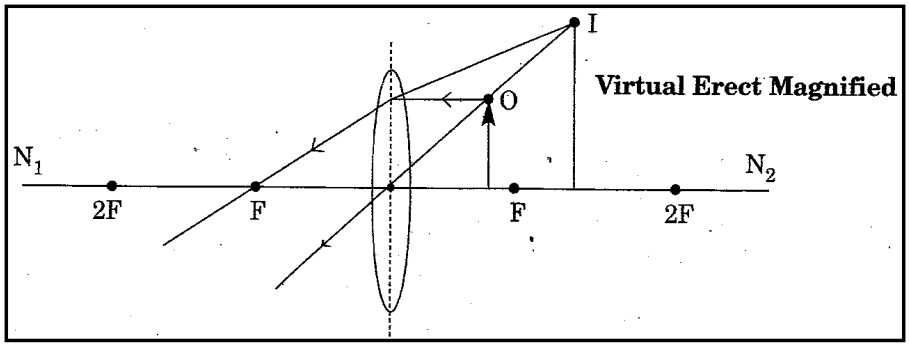




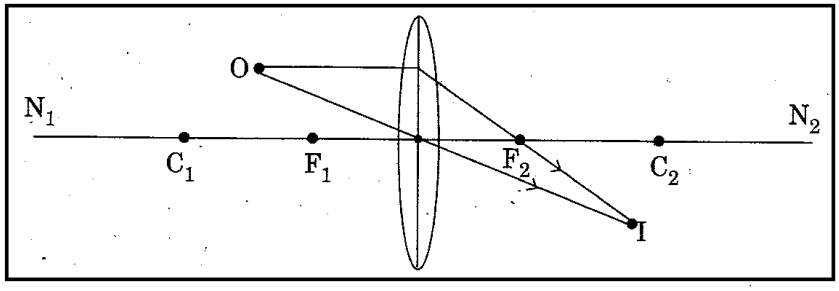
18. Figure Q-14 shows a point light source and its image produced by a lens with an optical axis N_1N_2. Find the position of the lens and its foci using a ray diagram. (AS5)

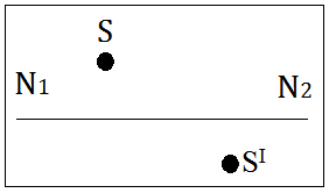






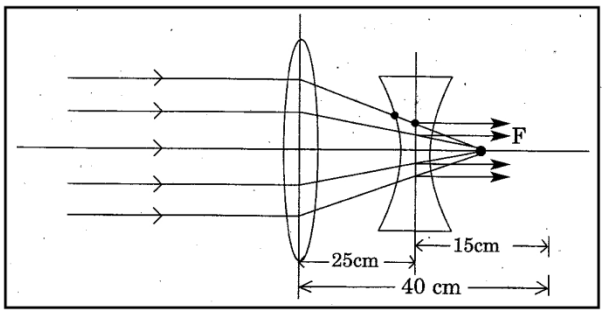
19. Find the focus by using a ray diagram using the position of source S and the image SI (AS5)





20. A parallel beam of rays is incident on a convergent lens with a focal length of 40cm. Where a divergent lens with a focal length of 15 cm should be placed for the beam of rays to remain parallel after passing through the two lenses? Draw a ray diagram. (AS5)

1. The focal length of conversing lens is 40 cm.
2. The focal length of diverging lens is 15 cm.
3. The separation between them (d) = 40-15=25 Cm
4. The diverging lens has to be placed in the focal length of the convergent lens.

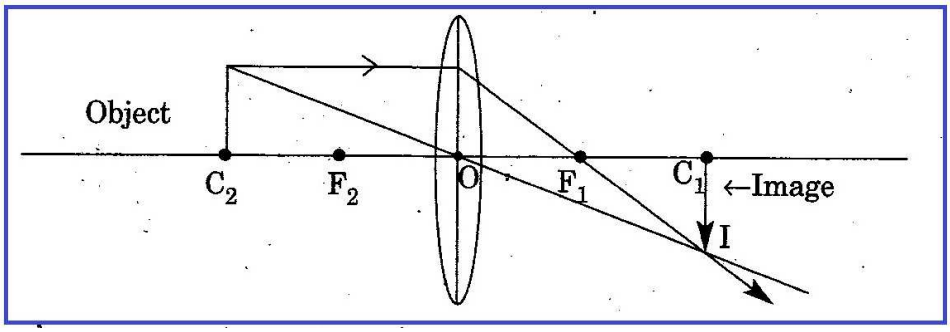


21. Draw a ray diagram for the following positions and explain the nature and position of image.
1). Object is placed at C_2 2). Object is placed between F_2 and optic centre P. (AS5)

Convex Lens :- 1). Object is placed at C_2

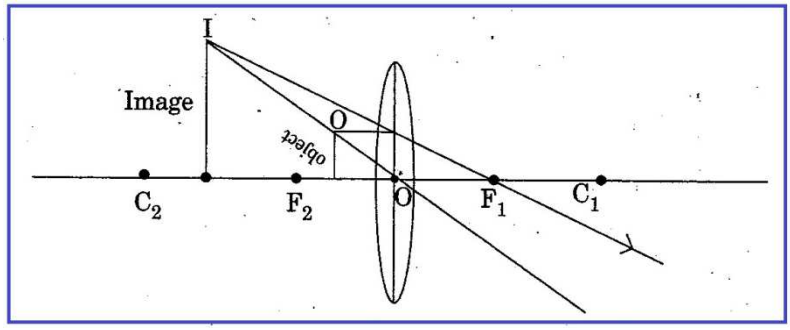
Nature: - Real and inverted

Position: - Formed at C1 having same size as that of object.



2). Object is placed between F_2 and optic centre P.

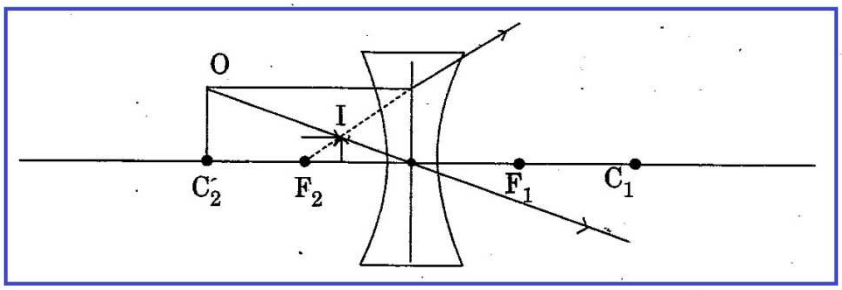
Nature: - Virtual Position: Same side of the object, magnified.



Concave Lens:-1). Object is placed at C_2

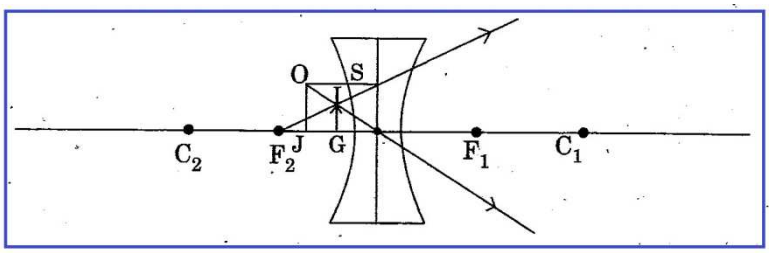
Nature:-Virtual and erect

Position:-Size as that of object, diminished.



2). Object is placed between F_2 and optic centre P.

Nature: - Virtual, erect **Position**: Same side of the object, diminished.



22. How do you appreciate the coincidence of the experimental facts with the results obtained by a ray diagram in terms of behaviour of images formed by lenses? (AS6)

1. We are getting exactly same type of image as prescribed in ray diagrams by lenses.
2. So, everyone should have to appreciate this and the work of scientists who made a lot of effort on ray diagrams successfully in getting same type of images as obtained from experiments.

23. Find the refractive index of the glass which is a symmetrical convergent lens if its focal length is equal to the radius of curvature of its surface. (AS7) (Ans: 1.5)

1. The given lens is a symmetrical convergent lens. i.e. $R_1=R_2=R$ and $f=R$.
2. Refractive index of air is 1. Let μ be the refractive index of the lens.
3. $\frac{1}{f} = (\mu-1)\left[\frac{1}{R1} - \frac{1}{R2}\right] \Rightarrow \frac{1}{R} = (\mu-1)\left[\frac{1}{R} - \frac{1}{(-R)}\right]$

$$\Rightarrow \frac{1}{R} = (\mu-1)\left[\frac{1}{R} + \frac{1}{(R)}\right]$$
$$\Rightarrow \frac{1}{R} = (\mu-1)\left[\frac{2}{R}\right]$$
$$\Rightarrow 2(\mu-1) = 1$$
$$\Rightarrow \mu-1 = \frac{1}{2}$$
$$\Rightarrow \mu = 1+\frac{1}{3}$$
$$\Rightarrow \mu = \frac{3}{2}$$
$$\Rightarrow \mu = 1.5$$

$\therefore$ The refractive index of the glass is 1.5

24. Find the radii of curvature of a convexo –concave convergent lens made of glass with refractive index n=1.5 having focal length of 24cm. One of the radii of curvature is double the other. (Ans:R_1=6cm,R_2=12cm) (AS7)

Given :- Refractive index of the glass, n=1.5

Focal length , f= 24

Let the radius of curvature of convex surface = R_1

Let the radius of curvature of concave surface = $R_2 = 2R_1$

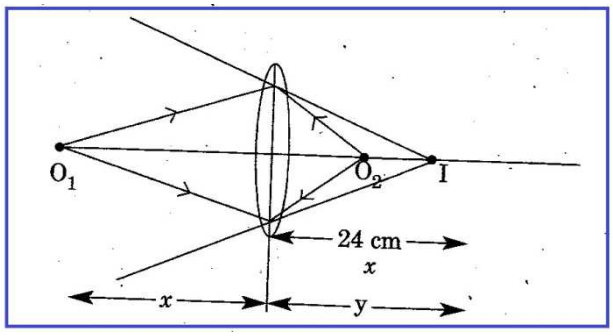
Formula :- $\frac{1}{f} = (\mu-1)\left[\frac{1}{R1} - \frac{1}{R2}\right] \Rightarrow \frac{1}{24} = (1.5-1)\left[\frac{1}{R1} - \frac{1}{2R1}\right]$

$\Rightarrow \frac{1}{24} = (0.5)\left[\frac{2-1}{2R1}\right]$ $\Rightarrow \frac{1}{24} = (0.5)\left[\frac{1}{2R1}\right]$

$\Rightarrow \frac{1}{2R1} = \frac{1}{24x0.5}$ $\Rightarrow 2R_1 = 24 \times 0.5$ $\Rightarrow R_1 = \frac{24\,x\,0.5}{2} = 6$ Cm

$R_2 = 2R_1 = 2 \times 6 = 12$ Cm

25. The distance between two point sources of light is 24cm .Where should a convergent lens with a focal length of f=9cm be placed between them to obtain the images of both sources at the same point? (AS7)



Given :- Focal length, f = 9 Cm

Suppose x is the distance of the first object from the lens.

Let u =y and v =–x

Lens formula $\frac{1}{f} = \frac{1}{u} - \frac{1}{v} \Rightarrow \frac{1}{9} = \frac{1}{y} - \frac{1}{-x} \Rightarrow \frac{1}{y} = \frac{1}{9} - \frac{1}{x}$ ---(1)

For the second object O2 where image is also formed at I.

Let u = –(24–x) v = –y

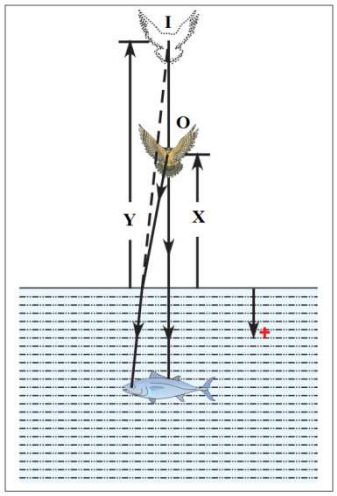
Lens formula $\frac{1}{9} = \frac{1}{-(24-x)} - \frac{1}{y} \Rightarrow \frac{1}{y} = \frac{1}{(24-x)} - \frac{1}{9}$ ---(2)

From (1) and (2), we have $\frac{1}{(24-x)} - \frac{1}{9} = \frac{1}{9} - \frac{1}{x} \Rightarrow x^2 - 24x + 108 = 0$

Solving for x gives x= 18 Cm and x= 6 Cm

∴ Lens should be placed 18 cm and 6 cm to the right of the first object.

26. Suppose you are inside the water in a swimming pool near an edge. A friend is standing on the edge. Do you find your friend taller or shorter than his usual height? Why? (AS7)



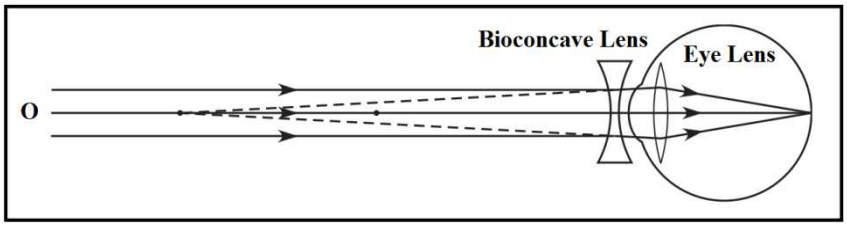
1. Let the actual height of the person be 'x' feet.
2. $\frac{Refractive\ index\ of\ air}{Refractive\ index\ of\ water} = \frac{Actual\ height\ of\ the\ man}{Apparent\ height\ of\ the\ man}$
3. $\frac{1}{1.33} = \frac{x}{Apparent\ height\ of\ the\ man}$
4. Apparent height of the man = 1.33XActual height
   = 1.33 times of the actual height of the person.
5. Hence, you find your friend is taller his usual height.

Chapter – 7

Human eye and Colourful world

1. How do you correct the eye defect, Myopia? (AS1)

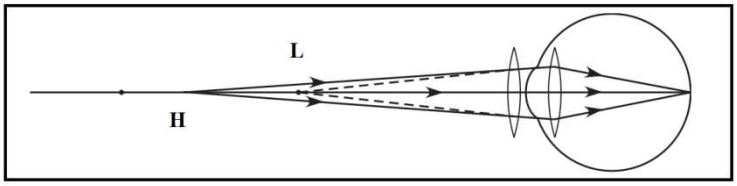
Myopia: – 1. The defect in which people cannot see objects beyond far point is called Myopia.
2. Myopia is also known as 'near sightednesses.



Correction: – 1. Eye lens can form clear image on retina, when an object is placed between far point and point of least distance of clear vision.
2. If we could able to bring the image of the object kept beyond far point , between the far point and the point of least distance of clear vision using a lens, this image act as an object for eye lens.
3. This can be possible only when a concave lens is used.

2. Explain the correction of the eye defect, Hypermetropia?

Hypermetropia: – 1.The defect in which people cannot see objects before near point is called Hypermetropia.
2. Hypermetropia is also known as 'farsighted nesses.



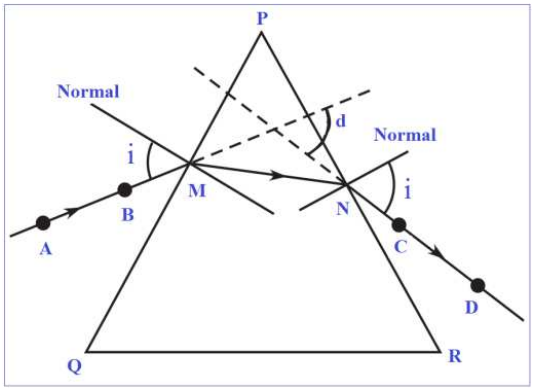
Correction: – 1. Eye lens can form clear image on retina when any object is placed beyond near point.
2. To correct the defect of hypermetropia, we need to use a lens which forms image of object beyond near point between near point (H) and least distance of clear vision (L).
3. This can be possible only when a double convex lens is used.

3. How do you find experimentally the refractive index of material of a prism (AS1?)

Aim: – To find the refractive index of the prism.

Material required: – Prism, piece of white chart of size 20x20 cm, pencil, pins, scale & protractor.

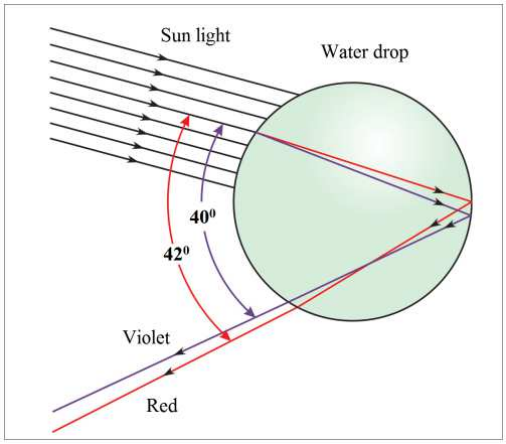
Procedure: -



1. Place the prism on the white chart and draw the boundary lines by using a pencil.
2. Remove the prism and name the vertices as P, Q and R.
3. Calculate the angle of the prism ($A=60^0$) and noted in your book.
4. Now fix two pins vertically on the line at points A and B as shown in the figure.
5. Observe the other side of the prism and fix another two pins such that AB and CD appear to lie along the straight line.
6. The angle of incident and angle of emergent are intersect at one point is called angle of deviation (D).
7. The refractive index of a prism is calculated by using the formula,

$$n = \frac{Sin(\frac{A+D}{2})}{Sin(\frac{A}{2})}$$

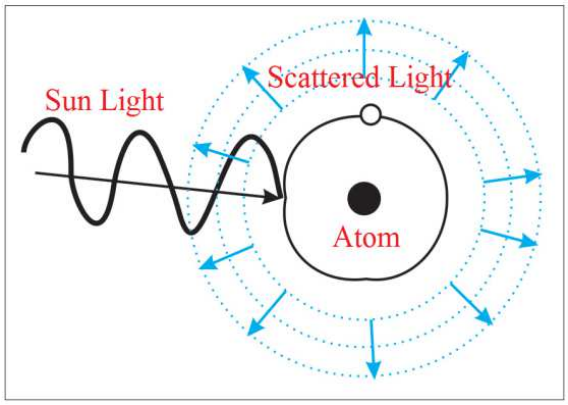
4. Explain the formation of Rainbow? (AS1)



Formation of Rainbow: - 1. The beautiful colours of rainbow are due to dispersion of the sunlight by millions of tiny water droplets.

2. Let us consider a case of an individual water drop.
3. The ray of sunlight enters the drop near its top surface.
4. At this first refraction, the white light is dispersed into its spectrum of colours, violet being deviated the most and red the least.
5. Reaching the opposite side of the drop, each colour is reflected back into the drop because of total internal reflection.
6. If you see at an angle between 40^0 and 42^0, you will observe remaining colours of VIBGYOR.

5. Explain briefly the reason for the Blue of the sky? (AS1)



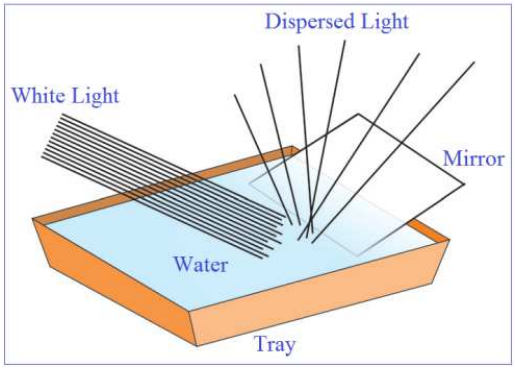
1. The reason for the appearance of sky in blue colour is due to the phenomenon of scattering of sunlight by the atoms or molecules present in the sky.
2. Our atmosphere contains Nitrogen and Oxygen.
3. When sun rays falls on these atoms, the size of these molecules are comparable to the wavelength of blue light.
4. These molecule act as scattering centers for scattering of Blue light.
5. So the sky appears to be Blue in colour.

6. Explain two activities for the formation of artificial rainbow? (AS1)

Activity-1: -

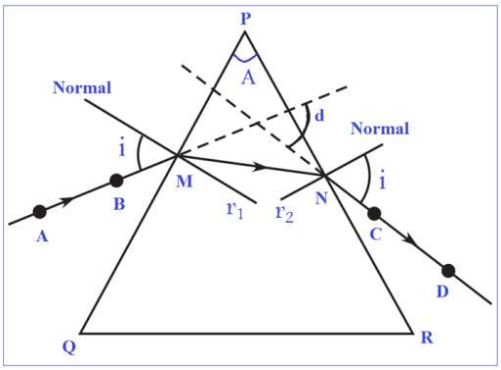
1. Take a prism and place it in between the light source and white wall.
2. Sent a light source such that the rays are falls on the prism through the narrow slit of a wooden plank.
3. Switch on the light. Adjust the height of the prism such that the light falls on one of the lateral surfaces.
4. We observed that the emergent light forms an artificial rainbow on the wall.

Activity-2: -



1. Take a tray and fill it with water.
2. Place a mirror in the water such that it makes an angle to the water surface.
3. Now focus white light on the mirror through the water as shown in figure.
4. Try to obtain colour on a white card board sheet kept above the water surface.
5. We observe that a white ray of light splits into certain different colours called VIBGYOR.

7. Derive the refractive index of the material in the case of prism? (AS1)



1. Consider the following ray diagram, from triangle OMN, we get $d = (i_1 + i_2)-(r_1 + r_2)$ ----- (1)
2. From triangle PMN, $A = r_1 + r_2$----- (2)
3. From (1) and (2), we have $A+d = r_1 + r_2 + (i_1 + i_2)-(r_1 + r_2)$

$$= r_1 + r_2 + i_1 + i_2 - r_1 - r_2$$

$$A+d = i_1 + i_2 \text{----- (3)}$$

4. Using Snell's law at M, $n_1 = 1$, $I = i_1$, $n_2 = n$ and $r = r_1$ gives, $\text{Sin } i_1 = n \text{ Sin } r_1$----- (4)
5. At N with $n_1 = n$, $I = r_2$, $n_2 = 1$ and $r = i_2$ gives $n \text{ Sin} r_2 = \text{Sin } i_2$----- (5)
6. When $i_1 = i_2$, angle of deviation (d) becomes angle of minimum deviation (D).
7. Then equation (3) becomes $A+D = i_1+i_1 = 2i_1 \Longrightarrow i_1 = \frac{(A+D)}{2}$
8. If $i_1 = i_2$, then $r_1 = r_2$. So from equation (2), we get $2r_1 = A$ (or) $r_1 = \frac{A}{2}$.
9. Substitute i1 and r1 in equation (4),we get $\text{Sin}\left(\frac{A+D}{2}\right) = n.\ \text{Sin}\left(\frac{A}{2}\right)$

$$\therefore n = \frac{\text{Sin}\left(\frac{A+D}{2}\right)}{\text{Sin}\left(\frac{A}{2}\right)}$$

10. This is the refractive index of the prism.

8. Light of wavelength λ_1 enters a medium with refractive index n_2 from a medium with refractive index n_1. What is the wavelength of light in second medium? (Ans: $\lambda_2 = \lambda_1 \frac{n1}{n2}$.) (AS 1)

1. The wave length of the first medium is λ_1 and refractive index is n_1.
2. The wave length of the first medium is λ_2 and refractive index is n_2.
3. From Snell's law, we have $\frac{\lambda 1}{n2} = \frac{\lambda 2}{n1} \Longrightarrow \frac{n1}{n2} = \frac{\lambda 2}{\lambda 1} \Longrightarrow \lambda_2 = \lambda_1 \frac{n1}{n2}$.

9. Assertion (A): The refractive index of a prism depends only on the kind of glass of which it is made of and the colour of light. (AS 2)

Reason (R) :- The refractive index of a prism depends on the refracting angle of the prism and the angle of minimum deviation.

a. Both A and R are true and R is the correct explanation of A.

b. Both A and R are true and R is not the correct explanation of A.

c. A is true but R is false.

d. Both A and R are false.

e. A is false but R is true.

Both A and R are true and R is not the correct explanation of A.

Reason: - 1. It is found that as the refractive index of material decreases, the angle of deviation decreases.

2. This means, the angle of deviation depends on the refractive index of the material of the prism.

10. Assertion (A):- Blue colour of sky appears due to scattering of light.

Reason (R):- Blue colour has shortest wavelength among all colours of white light. (AS 2)

a. Both A and R are true and R is the correct explanation of A.

b. Both A and R are true and R is not the correct explanation of A.

c. A is true but R is false.

d. Both A and R are false.

e. A is false but R is true.

A is true but R is false.

Explanation :- 1. Sky appears blue due to scattering of light.

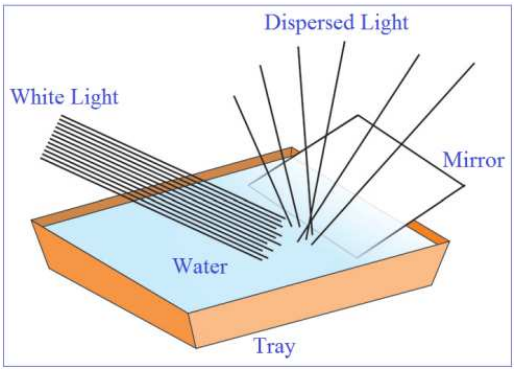
2. Violet colour has the shortest wavelength among all the colours of white light.

11. Suggest an experiment to produce rainbow in your classroom and explain procedure. (AS 3)

Aim: - Production of rainbow in a class room.

Material required:- Light source, mirror, plastic tray, water etc.

Procedure:-

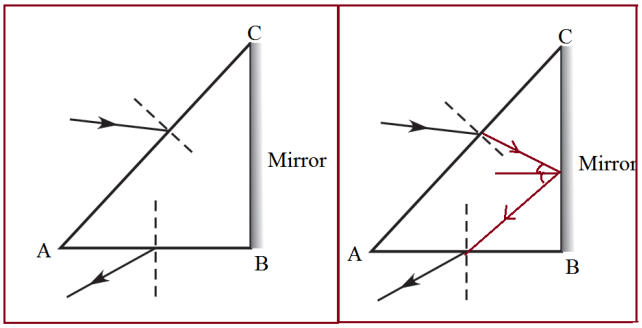


1. Take a tray and fill it with water.
2. Place a mirror in the water such that it makes an angle to the water surface.
3. Now focus white light on the mirror through the water as shown in figure.
4. Try to obtain colour on a white card board sheet kept above the water surface.
5. We observe that a white ray of light splits into certain different colours called VIBGYOR.

12. Prisms are used in binoculars. Collect information why prisms are used in binoculars. (AS4)

1. The size of binoculars is reduced by prism.
2. We get good image with more brightness.
3. Object size and optical quality should be increased by using prisms in binoculars.

13. Incident ray on one of the face (AB) of prism and emergent ray from the face AC are given in the following figure. Complete the ray diagram. (AS5)



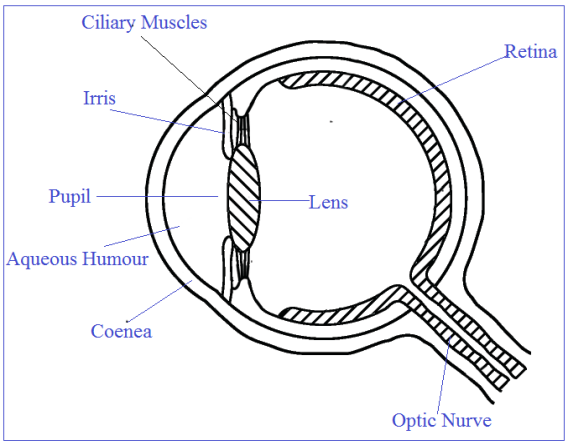
14. How do you appreciate the role of molecules in the atmosphere for the blue colour of the sky? (AS6)

1. The Blue appearance of sky is due to the molecules of N2 and O2 present in the atmosphere.
2. The sizes of these molecules are comparable to the wave length of Blue light.
3. These molecules act as scattering centers for scattering of blue light.
4. So, we appreciate the role of molecules in the atmosphere for the blue colour of the sky.

15. Eye is the only organ to visualize the colourful world around us. This is possible due to accommodation of eye lens. Prepare a six line stanza enlighten your wonderful feelings. (AS 6)

Eyes are very helpful.
Which makes our world colourful.
Eyes make you beautiful.
If you take the eyes careful.
Our life is always Wonderful.
Finally we live peaceful.

16. How do you appreciate the working of Ciliary muscles in the eye? (AS 6)



1. Ciliary muscle is helpful to change its focal length by changing radii of curvature of eye lens.
2. When the eye is focused on a distant object, the ciliary muscles are relaxed so that the focal length of eye lens has its maximum value as a result we see the object clearly.
3. When the eye is focused on a closer object the ciliary muscles are strained and focal length of eye-lens decreases and we see the object clearly.

4. This process of adjusting focal length is called "accommodation".
5. So we appreciate the working of Ciliary muscles in the eye.

17. Why does the sky sometimes appear white? (AS7)

1. In a hot day due to rise in the temperature, the water vapours of atmosphere is increases.
2. These water molecules scatter the colours of other frequencies (other than blue).
3. All such colours of other frequencies reach your eye and white colour is appeared to you.

18. Glass is known to be transparent material. But ground glass is opaque and white in colour.Why? (AS7)

1. We know glass is a frozen liquid.
2. If we rub the glass it loss some of the water molecules contain in it.
3. So, it appears as to be opaque and white on colour.

19. If a white sheet of paper is stained with oil, the paper turns transparent. Why? (AS7)

1. Paper is white solid material and observant.
2. When it absorbs the water, it becomes transparent.
3. Oil is a liquid that paper will absorb only the oil does not dry in the paper.

20. A light ray falls on one of the faces of prism at an angle 40^0 so that it suffers angle of minimum deviation of 300. Find the angle of prism and angle of refraction at the given surface. (Ans:50^0,25^0) (AS7)

Given:- Angle of incident $i_1 = 40^0$

Angle of minimum deviation, $D = 30^0$

We know $A+D = 2i \Longrightarrow A= 2i-D= 2x40^0-30^0 =80^0-30^0 = 50^0 \Longrightarrow A = 50^0$

Angle of refraction $= \frac{A}{2} = \frac{50}{2} = 25^0$

21. The focal length of a lens suggested to a person with Hypermetropia is 100cm. Find the distance of near point and power of the lens. (Ans: 33.33cm, 1D) (AS7)

Given:- The focal length of the lens, f= 100cm

Image distance (V) = Distance of near point = -d

Object distance, u = -25 cm

Lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Longrightarrow \frac{1}{100} = \frac{1}{d} - \frac{1}{(-25)} \Longrightarrow \frac{1}{d} = \frac{1}{25} - \frac{1}{100} \Longrightarrow \frac{1}{d} = \frac{4-1}{100} \Longrightarrow \frac{1}{d} = \frac{3}{100} \Longrightarrow d= \frac{100}{3}$ =33.33cm.

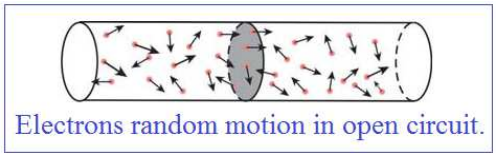
Power of lens, $p= \frac{100}{f} = \frac{100}{100}$ =1 Diopter.

Chapter-11

Electricity

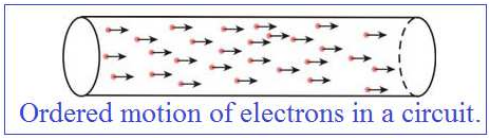
1. Explain how electro flow causing electric current with Lorentz–Drude theory of electrons. (AS1)

1. Drude and Lorentz proposed the conductors like metals contain large number of free electrons and this arrangement is called lattice.
2. The electrons move randomly in lattice space of conductor in an open circuit as shown below.



Electrons random motion in open circuit.

3. When the ends of the conductor are connected to a battery, the electrons are arranged in ordered motion as shown in the figure.



Ordered motion of electrons in a circuit.

4. This ordered motion of electrons is called electric current.

2. How does a battery work? Explain. (AS1)

Working of a Battery: – 1. In a battery the chemical energy converted into the electrical energy.

2. Battery consists of two metal plates and a chemical.
3. The electrolyte between the two metal plates consists of positive and negative ions.
4. Depending on the nature of the chemical positive ions move towards one of the plate and negative ions move opposite direction.
5. As a result for the constant potential energy forms between the two terminals of a battery.
6. This is the working of a battery.

3. Write the differences between potential difference and emf. (AS1)

Potential differences:–Work done by the electric force on unit charge is called potential differences.

$$V = \frac{W}{q}$$

Electro Motive Force (emf):– The work has done by the cell to move unit positive charge from negative terminal to positive terminal of the battery.

$$emf = \frac{W}{q}$$

4. How can you verify that the resistance of a conductor is temperature depends? (AS1)

1. When a conductor is connected to a battery, the free electrons start moving with a drift speed in a specified direction.
2. During the motion, the electrons collide with positive ions of the lattice and come to halt.
3. This means that they loss mechanical energy in the form of heat.
4. This proves that the resistance of a conductor is temperature dependent.

5. Why do you mean by electric Shock? Explain how it takes place? (AS1)

1. The electric shock is a combined effect of potential difference, electric current and resistance of the human body.
2. When current flows through the human body, it chooses the path which offers low resistance.
3. The current passing through the human body, the current and resistance of human body goes on charging inversely.
4. Hence, the electric shock is a combined effect of potential difference, electric current and resistance of the human body.

6. Derive $R = \rho \frac{l}{A}$ (AS1)

1. The resistance of a conductor is directly proportional to the length of the conductor.

   i.e., $R \propto l$ ..... (1)

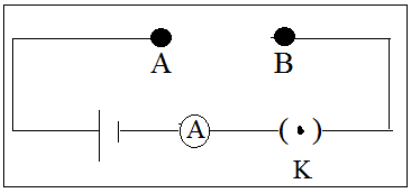
2. The resistance of a conductor is inversely proportional to the area of a cross section of the conductor.

   i.e., $R \propto \frac{1}{A}$ ..... (2)

3. From (1) and (2), we get $R \propto \frac{l}{A} \implies R = \rho \frac{l}{A}$, Where 'ρ' is a constant called specific resistance.

7. How o you verify that resistance of a conductor is proportional to the length of the conductor for constant cross section area and temperature? (AS1)

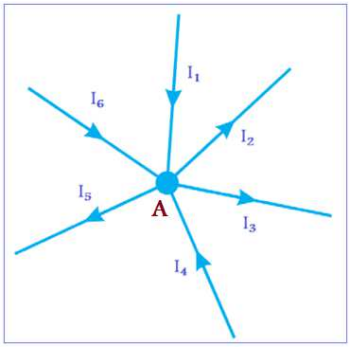
1. Make a circuit as shown in the figure.
2. Connect one of the iron spoke say 10 cm length between A and B.
3. Measure the value of current using the current note down in your note book.
4. Repeat this for other lengths of the iron spokes.
5. We note that the current decreases with increasing the length of the spoke.
6. So we note that resistance of a conductor is proportional to its length.



8. Explain Kirchhoff's laws with examples? (AS1)

Kirchhoff's laws: – Kirchhoff, in 1842, gave two general laws which are extremely useful in analyzing electric circuits. They are 1. The Junction law 2. The Loop law

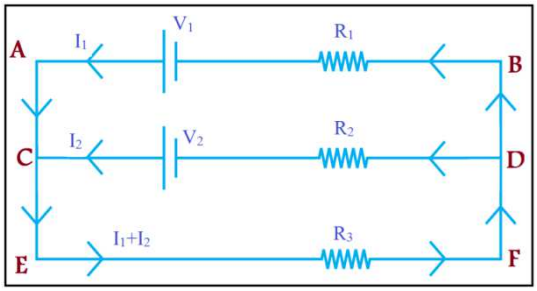
1. **The Junction Law: –** 1. The junction is a point where three or more conducting wires meet.
   2. In the figure A is called junction.
   3. From the figure, we have Therefore, $I_1 + I_4 + I_6 = I_2 + I_3 + I_5$.



2. The Loop Law: – 1. Let us apply Kirchhoff's second law to the above figure, for the loop ACDBA, $I_1 R_1 - I_2 R_2 = V_1 - V_2$

2. For the loop EFDCE, $I_2 R_2 + (I_1 + I_2) R_3 = V_2$

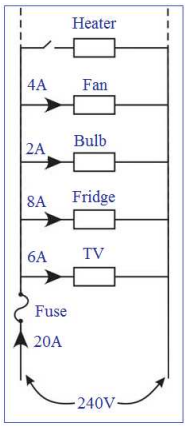
3. For the loop EFBAE, $I_1 R_1 + (I_1 + I_2) R_3 = V_1$



9. What is the value of 1KWH in Joules? (AS1)

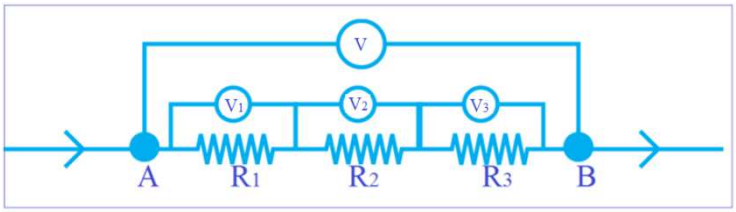
1KWH = 3.6×10^5 Joules.

10. Explain overloading of household current? (AS1)



1. The line wires that are entering into the meter have a potential difference about 240V and limit of current from the mains is 5-20A.
2. If we consume above 20A, then circuit results in overheating that may cause a fire.
5. This is called overloading as shown in the figure.
4. To prevent the damage due to overloading we connect electric fuse to the household circuit as in the above figure.

11. Deduce the expression for the equivalent resistance of the three resistors connected in series. (AS1)



1. Connections are made as shown in the figure.
2. From Ohm's law at $V_1 = I R_1$, $V_2 = I R_2$ and $V_3 = I R_3$
3. Since the resistors are connected in series, $V = V_1 + V_2 + V_3$
4. Substituting the values of voltages in the above equation $I R = I R_1 + I R_2 + I R_3$

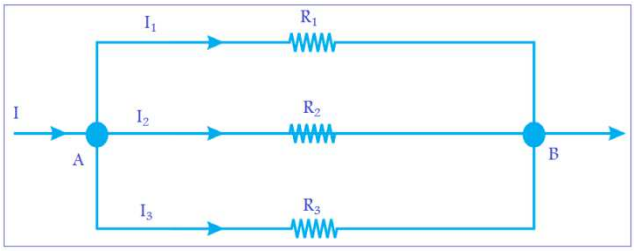
$$I R = I (R_1 + R_2 + R_3)$$

5. Thus, $R = R_1 + R_2 + R_3$

12. Why did we use fuses in household circuits? (AS1)

1. The fuses are consists of a thin wire of low melting point.
2. When the current in the fuse exceeds 20A, the wire will heat up and melt.
3. Hence all the electric devices are saved from damage that could be caused by overload.
4. Thus, we can save the house holding wiring and devices by using fuses.

13. Deduce the expression for the equivalent resistance of the three resistors connected in parallels. (AS1)



1. Connections are made as shown in the figure.
2. Ohm's law as, $I_1 = \frac{V}{R1}$, $I_2 = \frac{V}{R2}$ and $I_3 = \frac{V}{R3}$.
3. Since the resistors are in parallel, $I = I_1 + I_2 + I_3$
4. Substituting the value of currents in the above equation, $\frac{V}{R} = \frac{V}{R1} + \frac{V}{R2} + \frac{V}{R3}$

$$V\left(\frac{1}{R}\right) = V\left(\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}\right)$$

5. Thus, $\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} \Longrightarrow R = \frac{R1R2\,R3}{R1+R2+R3}$

14. Solver is better conductor of electricity than copper. Why do we use copper wire for conduction of electricity? (AS1)

1. Silver is costlier than copper.
2. So, we use copper wire for conduction of electricity even though silver is a better conductor of electricity.

15. Two bulbs have ratings 100W, 220V and 60W, 220V. Which one has the greatest resistance? (AS1)

1. We know that, $P = \frac{v^2}{R} \Longrightarrow R = \frac{v^2}{R}$
2. For the first bulb, $P = \frac{v^2}{R} = \frac{(220)^2}{100} = \frac{48400}{100} = 484\Omega$
3. For the second bulb, $P = \frac{v^2}{R} = \frac{(220)^2}{60} = \frac{48400}{60} = 806.6\Omega$
4. The second bulb having the 60W, 220W has the greater resistance.

16. Why don't we use series arrangement of electrical appliances like bulb, Television, fan and other in domestic circuits? (AS1)

1. In a series combination, if any electrical appliance is switched off, all the electrical appliances like bulb, TV, fan and other will be off.
2. Therefore, we use parallel arrangement of electrical appliances like bulb, TV, fan and other in domestic circuits.

17. A wire of length 1m and radius 0.1mm has a resistance of 100Ω. Find resistivity of the material? (AS1)

Given: - ℓ = 1m, r = 0.1 mm= 1000mm, R= 100Ω

Resistivity, ρ =?

Area of cross section of the wire, A= Πr^2 = 3.14 x $(0.1)^2$ = 0.0314

Restivity, $\rho = \frac{Rl}{A} = \frac{100 \times 0.0314}{1000}$ = 0.00314 Ohm-meter.

18. Why do we consider tungsten as a suitable material for making the filament of a bulb? (AS2)

1. We consider tungsten as a suitable material for making the filament of bulb.
2. Because of its higher resistivity values and the melting point (3422^0C).

19. Are the head lights of a car connected in series or parallel? Why? (AS2)

1. The lights of a car are connected in parallel.
2. Because in parallel connections both the head lights and lights get the same power.
3. If one head light goes out the other will still work.

20. Why should we connect the electric appliances in parallel to household circuit? What happens if they are connected in series? (AS2)

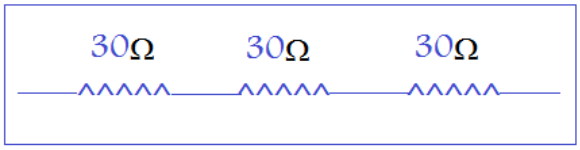
1. The electrical appliances are connected in parallel in household circuit.
2. Because, in parallel connections if any appliances is switched off, the other electrical appliances in the domestic circuit do not get off.

21. How should we connect the fuse in house wiring circuit? In series or in parallel? Why? (AS2)

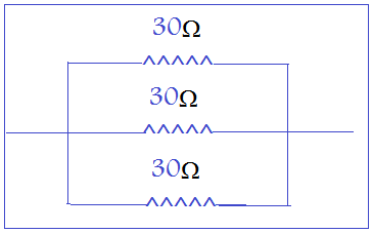
1. We connect the fuse in house wiring circuit is in series combination not in parallel.
2. When the fuse wire is melted due to overheating caused by overloading then the circuit will become open and prevents the flow of current into the household circuit.

22. Suppose that you have three resistors each of value 30Ω . How many resistors can you obtain by Various combinations of these three resistors? Draw diagrams in support of yur predictions. (AS2)

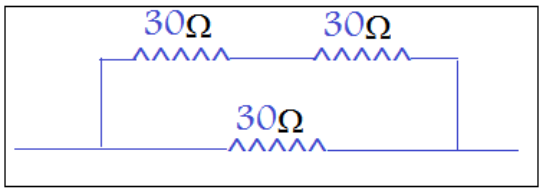
1. Connecting them in series.



2. Connecting them in parallel.



3. Connecting any two of them in series and the remaining third one in parallel.



23. State Ohm's law. Suggest an experiment to verify it and explain the procedure. (AS3)

Ohm's law: - Ohm's law states that the potential difference between the ends of a conductor is directly proportional to the electrical current passing through it.

Aim: - To verify Ohm's law.

Material Required: - Battery, rheostat, Resistance, Ammeter, Voltmeter and wire.

Procedure: - 1. Connections are made as shown in the figure.

2. By changing the position of the rheostat, change the flow of current in the circuit.

3. Note the reading in the voltmeter and ammeter and tabulated below.

S.No	Voltmeter Reading(V)	Ammeter Reading (i)	$R = \frac{V}{i}$
1.			
2.			
3.			
4.			

4. From the above table we observe that $\frac{V}{i}$ = constant. This is equeal to resistance of the wire.

5. So, Ohm's law is verified.

24. A. Take a battery and measure the potential difference. Make a circuit and measure the potential difference when the battery is connected in the circuit. Is there any difference in potential difference of battery? (AS4)

B. Measure the resistance of a bulb (filament) in open circuit with multi-meter. Make a circuit with elements such as bulb, battery of 12V and key in series. Close the key. Then again measure the resistance of the same bulb (filament) for every 30 seconds. Record the observations in a proper table. What can you conclude from the above results? (AS4)

A. Yes, there is some difference in the potential difference of the battery before using and after connecting.

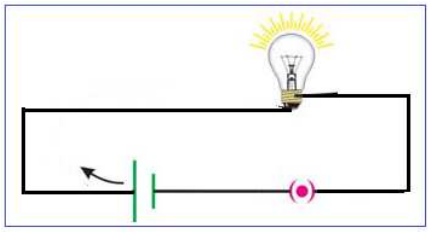
2. Because when the battery is connected in a circuit, the voltage slowly decreases due to consumption of chemical energy.

B. 1. Measure the resistance of the bulb by using a multimeter and note your note book.

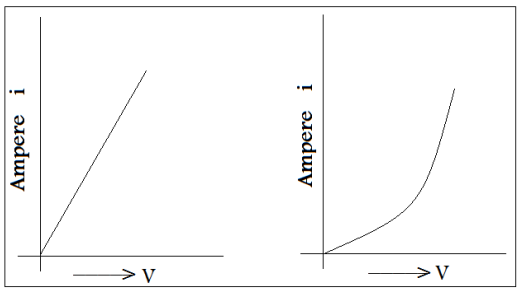
2. Connect a circuit as shown in the following switch on the circuit.

3. After few minutes, measure the resistance of bulb again and note down in your note book.

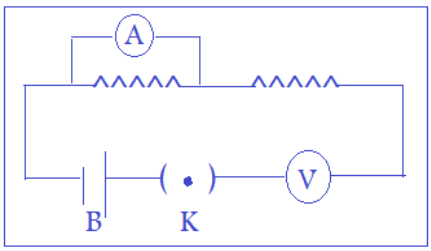
4. We noticed that resistance is increases due to the increases of temperature.



25. Draw a graph between V and I where V is the potential difference between the ends of the wire and I is the current through it? What is the shape of the graph? (AS5)



26. Draw a circuit diagram for a circuit in which two resistors A and B are connected in series with a battery, and a voltmeter is connected to measure the potential difference across the resistor A. (AS5)



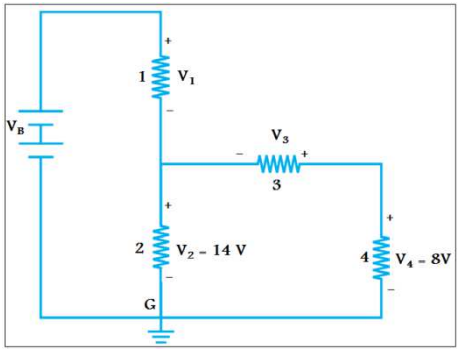
27. How can you appreciate the role of a small fuse in house wiring circuit in preventing damage to various electrical appliances connected to the circuit?(AS6)

1. The fuse consists of a thin wire of low melting point.
2. When the current in the fuse exceeds 20A, the wire will heat up and melt.
3. The circuit then become open and prevents the flow of current into the household circuit.
4. Thus we save the house holding wiring and devices by using fuses.
5. So, we appreciate the role of a small fuse in house wiring circuit in preventing damage to various electrical appliances connected to the circuit.

28. In the figure below the potential at A is ———————— when the potential at B is zero. (AS7)

The potential at A is, V= iR = 1 Ampere x 5Ω = 5V

29. Observe the circuit and answer the questions given below. (AS7)



Q1. Are resistors 3 and 4 in series? **Ans: -** No they are not in series. They are in parallel.

Q2. Are resistors 1 and 2 in series? **Ans: -** Yes, they are in series.

Q3. Is the battery in series with any resistors? **Ans: -** No

Q4. What is the potential drop across the resistor? **Ans:** The potential drop across the resistor '3' is V_3=8V.

Q5. What is the total emf in the circuit if the potential drop across the resistor 1 is 6V?

Ans: - The total emf in the circuit = $V_1 + V_2 + V_3 + V_4$ = 6+14+8+8 =36V.

30. If the resistance of your body is 100000Ω what would be the current that flow in your body when you touch the terminals of a 12V battery? (AS7)

Given: - V=12V

R = 1, 00,000 Ω

i =?

From Ohm's law, $i = \frac{V}{R} = \frac{12}{1,00,000}$ = 0.00012 Ampere.

31. A uniform wire of resistance 100Ω is melted and recasts into wire of length double that of the original. What would be resistance of the new wire formed? (AS7)

Given: - R_1 = 100Ω l_1 = 'l' (Say)

R_2 = ? $l_2 = 2l$

Formula: - $\frac{R1}{R2} = \frac{l1}{l2} \Rightarrow \frac{100}{R2} = \frac{l}{2l} \Rightarrow \frac{100}{R2} = \frac{1}{2} \Rightarrow R_2 = 200\Omega$

32. A house has 3 tube lights, two fans and a Television. Each tube light draws 40W. The fan draws 80W and the Television draw 60W. On the average, if all the tube lights are kept on for five hours, two fans for 12 hours and the television for five hours every day. Find the cost of electric energy used in 30 days at the rate of Rs. 3.00 per KWH. (AS7)

Total consumption of current in 30 days = $\frac{\{(3x40x5)+(2x80x12)+(5x60)\}30}{1000}$ Watts

$= \frac{(600+1920+300)30}{1000} = \frac{2820\,x\,30}{1000} = \frac{282\,x\,3}{10}$ = 84.6 Watts

Cost of 1 unit charge = Rs. 3.00/-

∴ Cost of 84.6 Watts = 84.6 x 3 = Rs. 253.8/-

33. A uniform wire of resistance 50Ω is equeal into five parts. These parts are now connected in parallel. Then the equivalent resistance of the combination is **[A]**

A. 2Ω B. 12Ω C. 250Ω D. 6250 Ω

34. A charge is moved from a point A to a point B. The work done to move unit charge during this process is called. **[C]**

A) Potential at A B) potential at B

C) Potential difference between A and B D) current from A to B

35. Joule/ coulomb is the same as [B]

A) 1 – watt B) 1 – volt C) 1– ampere D) 1 – ohm

36. The current in the wire depends [C]

A) Only on the potential difference applied B) only on the resistance of the wire

C) On both of them D) none of them

37. Consider the following statements. [A]

A. In series connection, the same current flows through each element.

B. In parallel connection, the same potential difference gets applied across each element.

A) Both A and B are correct B) A is correct but B is wrong

C) A is wrong but B is correct D) both A and B are wrong

38. The kilowatt hour is the unit of electric power consumption.

39. A thick wire has a less resistance than a thin wire.

40. An unknown circuit draws a current of 2A from a 12V battery its equivalent resistance is 6Ω.

41. The S.I unit of potential differences is Volt.

42. The S.I unit of current is Ampere.

43. Three resistors of values 2Ω, 4Ω and 6Ω are connected in series. The equivalent resistance of combination of resistors is 12Ω.

44. Three resistors of values 2Ω, 4Ω and 6Ω are connected in parallel. The equivalent resistance of combination of resistors is 12/11Ω.

45. The power delivered by a battery of emf 10V is 10W. Then the current delivered by the battery is 1 Ampere.

హంఫ్రీ డేవీ

సర్ హంఫ్రీడేవి 1778 డిసెంబరు 17న కార్న్‌వాల్‌లోని పెంజన్స్ (ఇంగ్లండ్)లో రాబర్ట్ డేవి, గ్రేస్ మిల్లెట్ దంపతులకు జన్మించాడు. పెంజన్స్ గ్రామర్ పాఠశాలలో ప్రాథమిక విద్యాభ్యాసం కొనసాగింది. ఒక వైద్యుడి దగ్గర అప్రెంటీస్ గా పని చేస్తూ రసాయన శాస్త్రం పై మక్కువ పెంచుకున్నాడు. 1799 లో బ్రిస్టన్ లోని న్యూమాటిక్ ఇన్‌స్టిట్యూట్ లో సహాయకుడుగా పని చేస్తూనే నైట్రస్ ఆక్సైడ్ యొక్క లక్షణాలను గురించి కొన్ని ముఖ్యమైన విషయాలు కనుగొన్నాడు. దీంతో ఆయన్ను 23 సంవత్సరాల వయసులోనే గ్రేట్ బ్రిటన్ లోని రాయల్ ఇన్‌స్టిట్యూషన్ వారు రసాయన శాస్త్ర ఆచార్యులుగా నియమించుకున్నారు.

1808లో బేరియం మరియు కాల్షియం మూలకాల్ని కనుగొన్నాడు. మెగ్నీషియం మరియు స్ట్రోనియం మూలకాలని మొట్టమొదటి సారిగా వేరు చేసింది కూడా ఆయనే.

1807లో డేవిడ్ హంఫ్రీ పొటాషియం హైడ్రాక్సైడ్ నుంచి పొటాషియం తయారుచేశాడు. సోడియం హైడ్రాక్సైడ్ నుంచి సోడియంను వేరుచేశాడు. 1808లో కాల్షియం మూలకాన్ని కనుక్కొన్నాడు. మెగ్నీషియం, బోరాన్, బేరియం మూలకాలను కూడా గుర్తించాడు. బొగ్గు గనుల్లో ఉపయోగించే రక్షక దీపాన్ని కనుగొన్నాడు. 1810లో క్లోరిన్ వాయువుకి ఆ పేరును ప్రతిపాదించాడు. డేవీ కున్న అద్భుతమైన బోధనా నైపుణ్యం, శాస్త్ర పరిశోధనలో ఆయనకున్న ట్రాక్ రికార్డులు వెరసి ఆయన్ను తన సమకాలికుల్లో అగ్రస్థానాన్ని కట్టబెట్టాయి. ఆ రోజుల్లో బ్రిటన్, ఫ్రాన్స్ దేశాలు రెండూ శత్రువులైనప్పటికీ 1808 లో ఫ్రెంచి ఇన్‌స్టిట్యూట్ వారి ఆయనకు నెపోలియన్ ప్రైజును బహూకరించారు. 1812 లో బ్రిటిష్ ప్రభుత్వం ఆయన్ను సర్ బిరుదుతో సత్కరించింది. 1818 లో ఇంకా ఉన్నతమైన బారోనెట్ తో సత్కరించింది. 1820 లో ఆయన రాయల్ సొసైటీకి అధ్యక్షుడయ్యాడు.

చంద్రునిపై ఒక బిలానికి డేవీ పేరు పెట్టారు. నెపోలియన్ బోనా పార్టీ నుంచి ఒక పతకాన్ని పొందాడు. 1819లో హంఫ్రీ డేవీకిసర్ బిరుదు ఇచ్చి గౌరవించారు. 1829 మే 29న 50వ ఏట స్విట్జర్లాండ్‌లోని జెనీవాలో మరణించాడు.

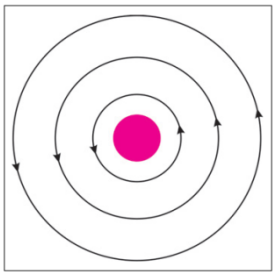
Chapter-12

Electromagnetism

1. Are the magnetic lines closed? Explain. (AS1)

1. Magnetic lines are imaginary lines or curves forms around the magnet.
2. Outside of the magnet they extend from north to south.
3. Inside of the bar magnet they may form south to north.
4. So, the magnetic lines are closed curves.

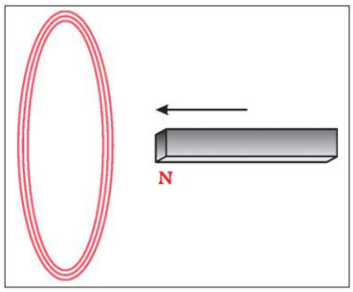
2. See figure, magnetic lines are shown. In what direction does the current through wire flow? (AS1)



1. In the diagram the magnetic lines are in anti-clock wise direction.
2. According ampere right hand rule the direction of current is vertically upwards.

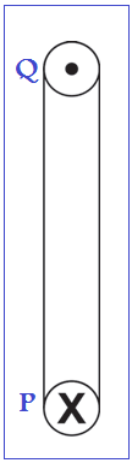
3. A bar magnet with North Pole facing towards coil moves as shown in fig.Q-3. What happens to magnetic flux passing through the coil? (AS1)

If the magnetic flux passing through a coil then current is generated in the coil.

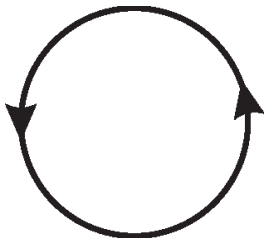


4. A coil is kept perpendicular to page. At P, current flows into the page and at Q it comes out of the page as shown in figure Q-4. What is the direction of magnetic field due to coil? (AS1)

1. At the top i.e. near Q, the direction of magnetic field is anti clock wise direction.
2. At the bottom i.e. near P, the direction of magnetic field is clock wise direction.



5. The direction of current flowing in a coil is shown in figure. What type of magnetic pole is formed at the face that has flow of current as shown in figure? (AS1)



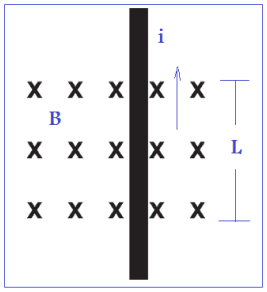
North Pole is forms at the face that has flow of current as shown in the figure.

6. Why do the picture appear distorted when a bar magnet is brought close to the screen of a television? Explain (AS1)

This is due to the fact that magnetic field exerts a force on the moving charge.

7. Symbol 'X' indicates the direction of a magnetic field into the page. A straight long wire carrying current along its length is kept perpendicular to the magnetic field. What is the magnitude of force experienced by the wire by the magnetic field? In what direction does it act? (AS1)

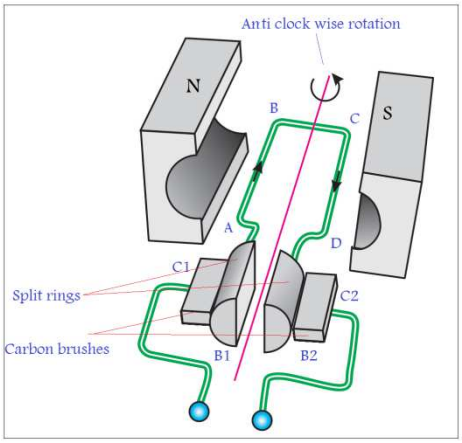
1. The magnitude of force experienced by the wire by the magnetic field is, F=BqV.
   Where 'B' is the magnetic induction, q is the charge and 'V' is the velocity.
2. The force that acts on the wire is perpendicular to the direction of the magnetic field induction.



8. Explain the working of electric motor with a neat diagram. (AS1)

Electric motor: it is a device which converts the electrical energy into mechanical energy.

Principle: when a current carrying in a conductor placed perpendicular to the magnetic field experiences a force.

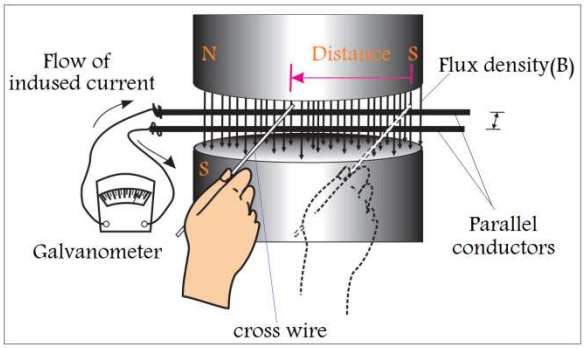


Working: 1.An electric motor consists of a rectangular coil ABCD called armature and kept in between the paraments magnets as shown in the figure.

2. When current is passing through the coil armature gets half rotation.
3. But the Coil continuous the rotation because of rotational inertia of motion.
4. In the same way couple rotates the coil in the same direction.
5. It is the working of an electrical motor.

9. Derive Faraday's law of induction from conservation of energy. (AS1)

Faraday's law: The induced emf generated in the closed loop is equal to the rate of change of magnetic flux passing through it.



1. The apparatus are arranged as shown in the figure.
2. Close the circuit by touching the parallel conductors with another bar conductor which is held by your hand.
3. If the cross wire moved to the left we observe the galvanometer deflection right side.
4. If the cross wire moved to the right side we observe the opposite side of the deflection.
5. This means a current will be set up in the circuit only there is an emf in the circuit,

10. The value of magnetic induction of uniform field is 2T. What is the flux passing through the surface of area 1.5 m^2 perpendiculars to field? (AS1)

Given: Magnetic field induction, B =2t

Surface area, A = 1.5 m^2

Magnetic flus, Φ =?

Formula: Φ = BA = 2x 1.5 =3 Webers.

11. An 8N force acts on a rectilinear conductor 20cm long placed perpendicular to magnetic field. Determine the magnetic field induction if the current in the conductor is 40A. (Ans: 1tesla) (AS1)

Given: F =8N

ℓ = 20 cm or $20x10^{-2}$ m

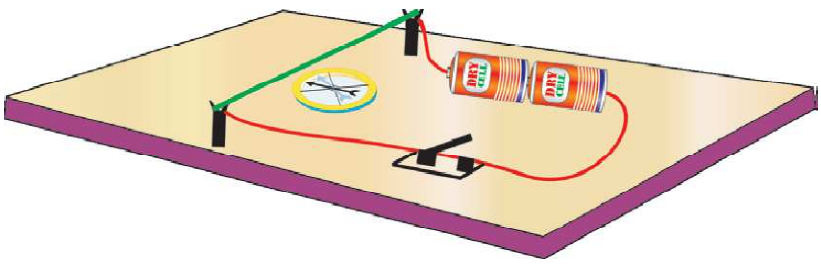
i= 40 A

B =?

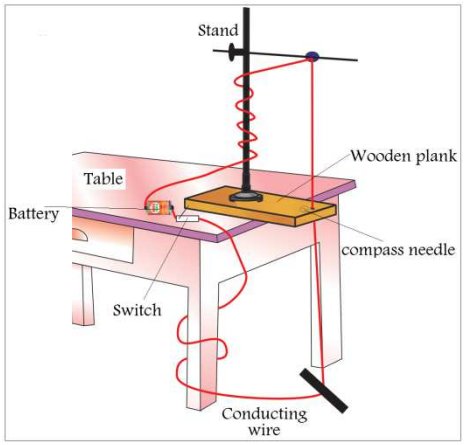
Formula: $B = \frac{F}{il} = \frac{8}{40\ x\ 20\ x\ 10^{-2}} = \frac{8\ x\ 10^2}{40\ x\ 20} = \frac{800}{800}$ = 1Tesla

12. Explain with the help of two activities that current carrying wire produces manetic field? (AS1)

Activity-1:



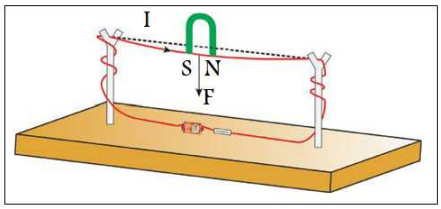
1. Arrange the equipments as shown in the figure.
2. Place one compass below the wire.
3. Switch on the circuit and we observe the compass needle gets deflected.
4. This deflection is due to the influence of electric field on magnetic field.



Activity-2: 1. The arrangements are made as shown in the figure.

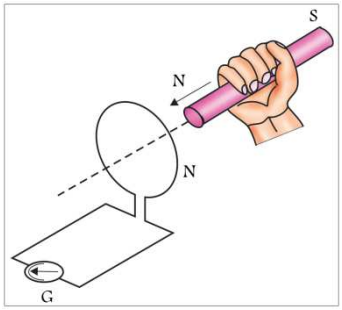
2. Use 3 volts battery in circuit. Switch on. Current flows through the wire.
3. When current flows, the magnetic needle deflected.
4. Hence, we conclude that the magnetic field surrounds current carrying conductors.

13. How do you verify experimentally that the current carrying conductor experiences a force when it is kept in magnetic field? (AS1)



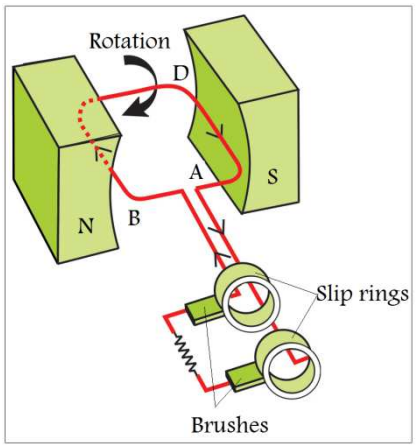
1. The arrangements are made as shown in the figure.
2. Bring a horse shoe magnet near the copper wire as shown in the figure.
3. The wire is deflecting upwards due to some force acts on it.
4. Repeat this by changing the direction of current in the circuit. We observe the direction of force is also changed.

14. Explain Faraday's law of induction with the help of activity? (AS1)



1. Connect the terminals of a coil to sensitive galvanometer as shown in the figure.
2. Push a bar magnet towards the coil whose north pole is facing towards the coil.
3. If the magnet is moved away from the coil, the needle in the galvanometer again deflects but in the opposite direction.
4. Whenever there is a continuous change of magnetic flux linked with closed coil, the current is generated in the coil.
5. This is one form of Faraday's law.

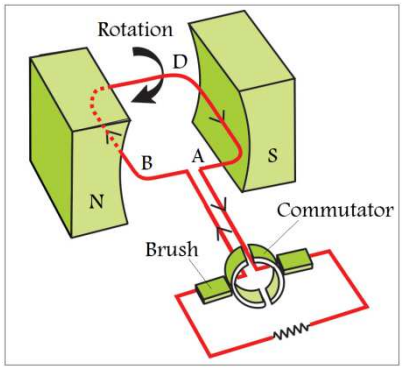
15. Explain the working of AC electric generator with a neat diagram. (AS1)



Working of an Ac elector generator: Electrical generator is a device which converts the mechanical energy into electrical energy.

1. Consider the rectangular coil is held between the poles of curve-shaped permanent magnet as shown in the figure.
2. As the coil rotates, the magnetic flux passing through coil changes and an induced current is generated in the coil.
3. The current obtained by this process changes its direction alternatively.
4. This current is called alternating current (AC).

16. Explain the working of DC generator with a neat diagram. (AS1)



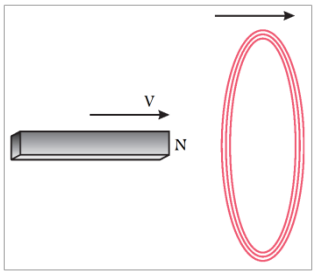
Working of a DC generator: 1. Consider the rectangular coil is held between the poles of curve-shaped permanent magnet as shown in the figure.

2. As the coil rotates, the magnetic flux passing through coil changes and an induced current is generated in the coil.
3. The current obtained by this process cannot change its direction.
4. This current is called Direct current (DC).

17. Rajkumar said to you that the magnetic field lines are open and they start at North Pole of bar magnet and end at South Pole. What questions do you ask Rajkumar to correct him by saying "field lines are closed"? (AS2)

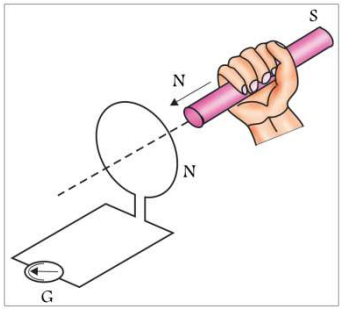
1. Are the magnetic field lines passing through bar magnet?
2. Do the magnetic lines of force have any direction within the magnet?
3. What is the direction of magnetic lines of force within the magnet?

18. As shown in figure both coil and bar magnet moves in the same direction. Your friend is arguing that there is no change in flux. Do you agree with his statement? If not what doubts you have? Frame questions about doubts you have regarding change in flux. (AS2)



1. If both moves in the same direction, is there any change in the linkage of flux with the coil.
2. Do they move with same speed in the same direction?
3. What happens if both magnet and coil move in opposite direction?
4. When North Pole is moved towards the coil what is the direction of current?

19. What experiment do you suggest to understand faraday's law? What material is required? What suggestions do you give to get good results of the experiment? Give precautions. (AS3)



Experiment: 1. Connect the terminals of a coil to sensitive galvanometer as shown in the figure.

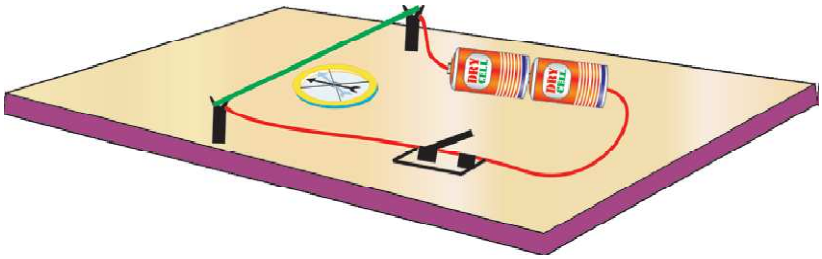
2. Push a bar magnet towards the coil whose north pole is facing towards the coil.
3. If the magnet is moved away from the coil, the needle in the galvanometer again deflects but in the opposite direction.
4. Whenever there is a continuous change of magnetic flux linked with closed coil, the current is generated in the coil.
5. This is one form of Faraday's law.

Material Required: 1. Galvano meter 2. A bar magnet 3. A coil of wire.

Suggestions: 1. To get more induced current.
2. The bar magnet should be a strong magnet.

3. The number of turns in the coil should be more.
4. The area of the coil should be more.

20. How can you verify that current carrying wire produces magnetic field with the help of experiment? (AS3)



1. Arrange the equipments as shown in the figure.
2. Place one compass below the wire.
3. Switch on the circuit and we observe the compass needle gets deflected.
4. This deflection is due to the influence of electric field on magnetic field.

21. Collect information about generation of current by using faraday's law. (AS4)

1. Current is generated in electric generator or dynamo with the help of Faraday's law.
2. Faraday's law of electromagnetic induction is also used in the working of a transformer.

22. Collect information about material required and procedure making simple electric motor from internet and make a simple motor on your own. (AS4)

Aim: Prepapare a simple electric motor.

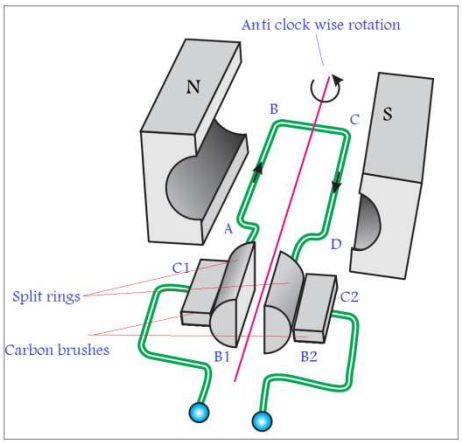
Material Required: 1.5m copper wire (about 25 gauge), 2 safety pins, 1.5 battery, magnets, and rubber bands.

Procedure: 1. Wind the nearly 10-15 turns to make a coil.
2. Copper coil is arranged in between the two safety pins as shown in the figure.
3. The other ends of the pins are fixing vertically as shown in the figure.
4. This completes the simple electric motor.

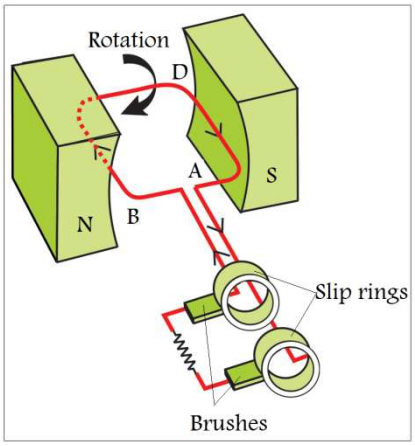
23. Collect information of experiments done by Faraday? (AS4)

1. Dynamo in electromagnetic induction.
2. Magnetic levitation.
3. Homopolar motor in magnetism.
4. Faraday's case.
5. Experiments on electrolysis.

24. Draw a neat diagram of electric motor. Name the parts. (AS5)



25. Draw a neat diagram of AC generator. (AS5)



26. How do you appreciate the faraday's law, which is the consequence of conservation of energy? (AS6)

1. When the bar magnet is moved towards the coil or away from the coil, current is generated in the coil.
2. This mechanical energy is converted in to electrical energy.
3. Hence, I appreciate the Faraday's law which is the consequence of conservation of energy.

26. How do you appreciate the relation between magnetic field and electricity that changed the life style of mankind? (AS6)

1. I appreciate the relation between magnetic field and electricity that changed the life style of mankind, which is as explained below.
2. We know magnetic field induction is,
   i. Directly proportional to the current. i.e. $B \propto I$ …..(1)
   ii. Inversely proportional to the radius of the coil. i.e. $B \propto \frac{1}{r}$ …..(2)
   iii. Directly proportional to number of turns. i.e. $B \propto N$ …..(3)
3. From (1), (2) and (3), we get, $B \propto \frac{iN}{R}$
4. This shows that, if current is more the magnetic field induction is also more.

27. Give a few applications of faraday's law of induction in daily life. (AS7)

1. During the security check, people made to walk through a large upright coil which produces a weak Ac magnetic field.
2. If we are carrying any significant quantities of iron, the magnetic flux changes and the induced current generated in the coil triggers an alarm.

28. Which of the various methods of current generation protects the nature well? Give examples to support your answer. (AS7)

The various methods of current generation protects the nature well are,

1. When speedily moving wind falls on the blades of a wind mill, it produces the current and is known as "wind power".
2. The method of production of electricity using solar energy, geothermal energy, tidal energy, wave energy, Bio-mass energy, and energy stored in water etc.

Hans Christian Oersted (1777 – 1851)

One of the leading scientists of the 19th century, played a crucial role in understanding electromagnetism. He gave lectures which were quite popular among the public and also learnt a lot during the tours. During one such lecture in April 1820, Oersted carried out an experiment that was never performed before. He placed a compass underneath a wire and then turned on electric current. The needle of the magnetized compass showed movement. Oersted recognized the significance of what he had just done. Earlier, it was believed that electricity and magnetism were two different forces. Oersted had demonstrated that they were interconnected. Through this observation he showed that electricity and magnetism were related phenomena. Some scientists, influenced by this experiment, continued with the modern field of "electromagnetism". Their research resulted in several new scientific theories and various vital inventions like the dynamo and the electric motor, created technologies such as the radio, television, and fiber optics.

The unit of magnetic field strength is named the Oersted in his honour. Oersted was made a foreign member of the Royal Swedish Academy of Sciences in 1822.

నిత్యం ఉదయించినా సూర్యుడు అలుపెరుగడు-పని మంతుడికి సాకులుండవు!

Even when rises as routine daily Sun feels no drudgery-An efficient workman pleads, no exceses.

Behind Every Great Scientist is a Great Mentor

Michael Faraday was probably the greatest experimental scientist of the nineteenth century. Faraday came from a very, very poor family. His father was a blacksmith. They had 12 children. He had no education. And early on in his life Faraday realized that he wanted to be a scientist. But in England at the time, in the early nineteenth century, you could not become a scientist unless you went to a university – Oxford or whatever. So he had no hope of going to university because he came from such a poor background and had no formal education.

He worked in a bookstore as a bookbinder, as an apprentice. So he was around books and he was able to read about electricity and chemistry, the fields that interested him. But all he would ever be in life would be a dilettante. He would only be able to get his knowledge from books. He would have no access to laboratories. It would be a useless career and it wouldn't lead anywhere and he would be a bookbinder his whole life. He needed a mentor and he realized it at about the age of 18 when he went and saw a lecture from the greatest chemist of his age, a man named Humphry Davy. Michael Faraday realized at that lecture that this man had a kind of knowledge that he could never get from a book.

And so he decided that he would somehow make Humphry Davy his mentor which was basically an impossible task or quest. Someone from Faraday's background had no access to that kind of world. But he went on a campaign that I detail in my book. He wrote him letters. He showed all of the incredible labor that he had gone through in the years of studying science on his own. And eventually he got his chance to enter Humphry Davy's laboratory on a certain level and prove himself. And he got the job as his apprentice and then his career completely took off and he became the greatest experimental scientist of the nineteenth century. But it would have never happened if he had never found the right mentor and connected himself to him.

G. Sree Kar M.Sc, B.Ed (9700842884)