

LAWS OF MOTION & GRAVITATION

01 MARK QUESTIONS

01. The acceleration in a body is due to
(balanced force, **unbalanced force**, electrostatic force, magnetic force)
02. The weight of 50kg person at the surface of earth is
(50N, 35N, 380N, **490N**)
03. The freezing of biotechnology products like vaccines require..... freezing systems)
(Helium, **Nitrogen**, Ammonia, Chlorine)
04. Light year is the unit of
(time, light intensity, **distance**, mass)
05. Mass of an object in 10kg. What is its weight on the earth.....($w=mg$, $g = 9.8m/s^2$)
(49N, 25N, **98N**, 100N)
06. The physical quantity which is equal to the rate of change of momentum is
(displacement, acceleration, **force**, impulse)
07. The momentum of a massive object at rest is
(very large, very small, **zero**, infinity)

02 MARKS QUESTIONS

01. Observe the figure and write the answer :

 - a. The resultant of these force is
 - b. Does the ball move?**Ans. :** a. The resultant of those forces is balanced forces
b. The ball does not move.
02. When a gun is fired, it exerts forward forces on the bullet.
Why does the gun recoil backwards?
Ans. : When a gun is fired it exerts forward force on the bullet. The bullet exerts an equal and opposite reaction force on the gun. This results in the recoil of the gun. This is based on Newton's third law of motion.
03. Correct the mistakes if any in the following statements.
 - a. One newton is the force that produces an acceleration of $1ms^{-2}$ in an object of 1 gram mass.
 - b. Action and reaction is always on the same body.**Ans. : Correction of statements:**
 - a. One newton is the force that produces an acceleration of $1ms^{-2}$ in an object of **1 kilogram** mass.
 - b. Action and reaction is always on the **different** bodies.
04. Fill in the blanks:
 - a. Force = x acceleration (mass / specific gravity)
 - b. Momentum = mass xvelocity / acceleration)**Ans. :**
 - a. Force = **mass** x acceleration
 - b. Momentum = mass x **velocity**
05. Fill in the blanks
 - a. is used as fuel for rocket

- (Liquid hydrogen / Liquid helium)
- b. is used for MRI
(Liquid hydrogen / Liquid helium) scan
Ans. : a. **Liquid hydrogen** is used as fuel for rocket
b. **Liquid helium** is used for MRI scan
06. The important use of cryogenic is cryogenic fuels.
What do you mean by cryogenic fuel?
Ans. : Cryogenic fuels are fuels that requires a **very low temperature** in order to maintain them in **liquid state**.
Cryogenic fuel mainly liquid hydrogen has been used as **rocket fuel**.
 07. Match A with B

A	B
01. Force	a. ms^{-1}
02. Momentum	b. kgm^2s^{-1}
03. Velocity	c. $kgms^{-1}$
04. Moment of a couple	d. $kgms^{-2}$

- Ans.**
- | A | B |
|------------------------|------------------|
| 01. Force | a. $kgms^{-2}$ |
| 02. Momentum | b. $kgms^{-1}$ |
| 03. Velocity | c. ms^{-1} |
| 04. Moment of a couple | d. kgm^2s^{-1} |

08. A body of mass 50kg has a momentum $250kgms^{-1}$.
What is the velocity?
Ans. : mass(m) = 50kg, momentum (p) = $250 kgms^{-1}$
Velocity(v) = ?
Momentum(p) = $m \times v$; $v = \frac{p}{m}$; $\frac{250}{50}$; $v = 5ms^{-1}$
09. Calculate the magnitude of the force which when applied to a body of mass 0.5kg produces an acceleration of $10ms^{-2}$
Ans. : Mass of a body (m) = 0.5kg
Acceleration (a) = $10ms^{-2}$
Force(ma) = ?
Force = $0.5kg \times 10ms^{-2}$;
= 5N;
The magnitude force = 5N
10. Correct the mistakes, if any in the following statements.
 - a. The momentum is the sum of the mass of an object and its velocity.
 - b. When a motor car makes a sharp turn at a high speed, we tend to get thrown to one side due to Newton's third law**Ans. :**
 - a. The momentum is the **product** of the mass of an object and its velocity.
 - b. When a motor car makes a sharp turn at a high speed, we tend to get thrown to one side due to **law of inertia**

11. The mass of an object is 30kg. What is the weight on the earth?

Ans. : Mass of an object(m) = 30kg
 Acceleration due to gravity (g) = 9.8ms^{-2}
 Weight (w) = mg ; = 30×9.8 ; w = 294N

12. In a solar system, there is an existence of force between sun and planets. Put forth questions to determine the force.

- a.
 b.

Ans. : a. Which law holds good for the force of attraction between the planets?

- b. State the importance of that law.

05 MARKS QUESTIONS

01. a. Place the following objects in the correct order from the lowest to the highest momentum. Assume that all of the objects are moving at their maximum velocity.

Freight train, Bus, Car, Cycle

{Hint : Momentum = mass x , velocity; $p=mv$ }

- b. Which objects has more momentum; a car travelling at 10km/hr or a baseball pitched at 150km/hr? Explain your answer.
 c. Newton's third law of motion. For every action there is an equal and opposite reaction. Explain this law, using one illustration.

Ans. : a. Momentum (p) = mass x velocity ; $p = mv$

The correct order of increasing value of momentum is Cycle , Bus, Car, Freight train

b. Speed of a car = 10km / hr (less acceleration)

Speed of a base ball = 150 km / hr

(more acceleration)

The ball has more momentum than the car. Since the speed of the car is less, the product of mass and velocity of the car (momentum of car) is very less and rate of change of momentum is also less due to less acceleration. But the base ball has a very high speed so the product of mass and its velocity is high. The momentum of base ball is greater than that of car. Base ball has more rate of change of momentum due to more acceleration.

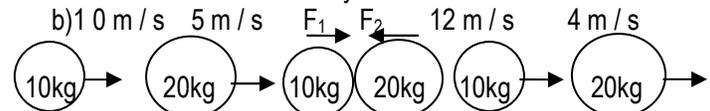
c. Newton's third law of motion:

"For every action there is an equal and opposite reaction"

Illustration:

When a gun is fired, it exerts forward force on the bullet. The bullet exerts an equal and opposite reaction force on the gun. This results in the recoil of the gun. So it must be remembered that the action and reaction always act on two different objects.

02. a) Newton's first law of motion gives a qualitative definition of force. Justify.



The figure represents two bodies of masses 10 kg and 20 kg and moving with an initial velocity of 10ms^{-1} and 5ms^{-1} respectively.

They are colliding with each other after collision they are moving with velocities 12ms^{-1} and 4ms^{-1} respectively.

The time of collision be 2sec. Then calculate F_1 and F_2 .

Ans. : a. **Newton's first law of motion**

An object remains in a state of rest or uniform motion in a straight line unless compelled to change that state by an applied unbalanced force.

This law gives a qualitative definition of force.

Justification:

The tendency of undisturbed object to stay or keep moving with the same velocity is called Inertia. That means, if there is no force, there is no change in the state of rest or of uniform motion.

b. Body A

mass $m_1 = 10\text{kg}$

Initial velocity $u_1 = 10\text{ms}^{-1}$

Final velocity $v_1 = 12\text{ms}^{-1}$

$t = 2\text{S}$

Body B

mass $m_2 = 20\text{kg}$

$u_2 = 5\text{ms}^{-2}$

$v_2 = 4\text{ms}^{-1}$

$$\text{(Action)} F_1 = \frac{m_2(v_2 - u_2)}{t} ; = \frac{20(4 - 5)}{2} ; \frac{20 \times -1}{2} ;$$

$$F_1 = \frac{-20}{2} ; -10\text{N}$$

$$F_1 = -10 \text{ (Force acting on B)}$$

$$\text{(Reaction)} F_2 = \frac{m_1(v_1 - u_1)}{t} ; = \frac{10(12 - 10)}{2} ; \frac{10 \times 2}{2} ;$$

$$F_2 = \frac{20}{2} ; 10\text{N}$$

$$F_2 = 10\text{N} \text{ (Force acting on A)}$$

03. a) Space stations are used to study the effects of long – space flight on the human body. Justify.

- b) Which would require a greater force for accelerating a 2kg of mass at 4ms^{-2} or a 3kg mass at 2ms^{-2}

Ans. : a. A space station is an artificial structure designed for humans to live and work in outer space for a period of time.

Space stations are used to study the effects of long space flight on the human body.

Space stations have various issues such as very low recycling rates, high radiation and lack of gravity. Some of these problems cause discomfort and long term health effects.

Effectuated vacuum on human body, cabin fever muscle atrophy and loss of muscle mass and bone mass are a few problems astronauts could face.

Future space habits may attempt to address these issues and are intended for long term occupation.

b. Force = ma

$$m_1 = 2\text{kg}; a_1 = 4\text{ms}^{-2}$$

$$m_2 = 3\text{kg}; a_2 = 2\text{ms}^{-2}$$

$$\text{Thus } F_1 = m_1 a_1 = 2\text{kg} \times 4\text{ms}^{-2} = 8\text{N}$$

$$F_2 = m_2 a_2 = 3\text{kg} \times 2\text{ms}^{-2} = 6\text{N}$$

$$F_1 > F_2$$

Thus acceleration 2 kg mass at 4 ms⁻² would require greater force.

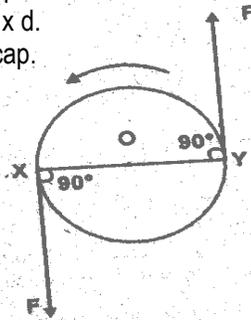
04. a. What is moment of force?

b. Give one example of couple.

c. Draw it diagrammatically and explain.

Ans. : a. The magnitude of the moment of the force F about a point is defined as the product of the magnitude of force and the perpendicular distance of the point from the line of action of the force moment of force = F x d.

b. Example of couple opening a bottle cap.



c. **Couple** : Two equal and opposite forces whose lines of action do not coincide are said to constitute a couple in mechanics.

Explanation : Two strings are tied to a wheel at the points X and Y and two equal and opposite rotate about O in an anticlockwise direction.

05. a. Define the first law of motion.

b. A constant force acts on an object of mass 10kg for a duration of 4S. It increases the object's velocity from 2ms⁻¹ to 8ms⁻¹. Find the magnitude of applied force.

c. Explain the first law of motion with a suitable example.

Ans. : a. **Newton's first law of motion:**

"An object remains in the state of rest or of uniform motion in a straight line unless compelled to change that state by an applied unbalanced force".

b. mass of an object(m) = 10

Initial velocity (u) = 2ms⁻¹

Final velocity (v) = 8ms⁻¹

$$\text{Force } (F) = \frac{m(v-u)}{t}; F = \frac{10(8-2)}{4}; \frac{10 \times 6}{4}; = 15\text{N}$$

Applied Force = 15N

c. **Illustration of first law of motion:**

First law of motion is also known as law of inertia.

Inertia is the tendency of undisturbed objects to stay at rest or to keep moving with the same velocity.

When a motor car makes a sharp turn at a high speed, we tend to get thrown to one side. We tend to continue in straight line motion. When an unbalanced force is applied by the engine to change the direction of motion of the motor car, we move to one side of the seat due to the inertia of our body.

06. a. State second law of motion.

b. Explain the second law of motion with suitable example.

c. Derive the value of force using the above law.

Ans. : a. **Newton's second law of motion:**

"The rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of force".

b. **Illustration of second law of motion:**

Let us consider a car with a dead battery is to be pushed along a straight road to give a speed of 1ms⁻¹ which is sufficient to start its engine. If one or two persons give a sudden push (unbalance force) to it, it hardly starts. But sometime it requires continuous push is required to accelerate the speed of the car. It means that the change of momentum of the car is not only determined by the magnitude of the force but also by the time during which the force is exerted. So the force necessary to change the momentum of the objects depends on the time rate at which the momentum is changed.

c. **Derivation of the Force:**

Mass of the object = m (moving in straight line)

Initial velocity = u ; time = t ; Final velocity = v

F = Force throughout the time t

Initial momentum of the object = mu

Final momentum of the object = mv

The change in momentum = mv - mu ; = m(v - u)(1)

Rate of change of momentum = $\frac{\text{Change of momentum}}{\text{time}}$

$$= \frac{m(v-u)}{t} \dots\dots\dots(2)$$

According to Newton's Second law of motion, this is nothing but applied force.

$$\text{Applied force } (f) = \frac{m(v-u)}{t};$$

$$\text{Acceleration } (a) = \frac{(v-u)}{t} \text{ Rate of change of velocity}$$

Applied force, F ∝ ma.

$$F = k.ma \dots\dots\dots(3)$$

Where k = proportionality constant.

The unit of force is so chosen the value of the constant, k = 1

$$F = ma$$

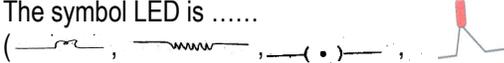
$$1 \text{ Unit of force} = 1\text{kg} \times \text{ms}^{-2}$$

$$= \text{kgms}^{-2} \text{ (or) newton (or) N}$$

ELECTRICITY & ENERGY

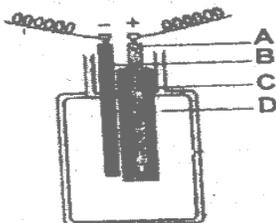
01 MARK QUESTIONS



01. Four cells each of emf "E" are joined in parallel to form a battery. The equivalent emf of the battery will be
($4E$, E , $\frac{E}{4}$, $E = 0$)
02. The symbol LED is
()
03. Kilowatt – hour is the unit of
(Potential difference, electric power, **electric energy**, change of momentum)
04. Which one of the following represents ohm's law?
($\frac{I}{V} = \text{constant}$, $\frac{V}{I} = \text{constant}$, $VI = \text{constant}$, $\frac{I}{V^2} = R$)
05. The potential difference required to pass a current of 0.2A in a wire of resistance of 20 ohm is
(100V, **4V**, 0.01V, 40V)
06. Which of the following is used in making fuse wire?
(**37%lead+63%tin**, 63%lead+37%tin, 50%lead + 50%tin, 37%copper = 63%aluminium)
07. Surface absorbs more heat than any other substances under identical conditions.
(White, **Black**, Red, Yellow)
08. What is the potential difference between the live wire and neutral wire in our country?
(110V, 10V, **220V**, 1000V)
09. Two electric bulbs have resistances in the ratio 1 : 2, If they are joined in series, the energy consume in these are in the ratio.....
(**1 : 2**, 2 : 1, 4 : 1, 1 : 1)
10. At which temperature nuclear fusion reaction takes place?
($10^{-7}k$, **10^7k** , $10^{-2}k$, 10k)
11. The atomic number of natural radioactive element is ...
(**greater than 82**, less than 82, not defined, atleast 92)
12. Which one of the following is the renewable source of energy?
(Hydropower, Fossil fuel, **Solar energy**, Petrol)

02 MARKS QUESTIONS

01. Leclanche cell diagram is given below table the parts.



Ans. :

A - Carbon rod
C - Porus pot

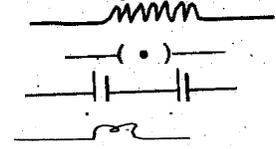
B - Zinc rod
D - Ammonium chloride solution

02. Match the following:

Components

01. Switch (Closed)
02. Battery
03. Electric Bulb
04. Resistance

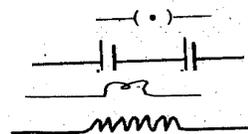
Symbols



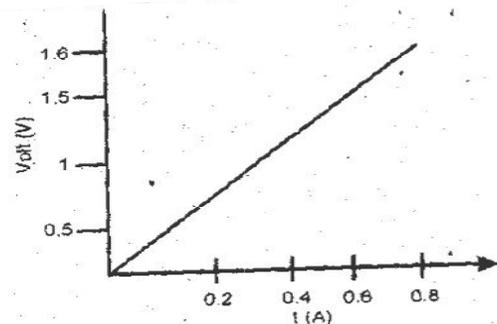
Ans. : Components

01. Switch (Closed)
02. Battery
03. Electric Bulb
04. Resistance

Symbols



03. Harmful radiations originate from a nuclear reactor. Precautions are taken to see that they do not become a threat to living beings. What are these precautions?
Ans. : 01. Radioactive materials are kept in thick walled lead container.
02. Lead aprons and lead gloves are used while working in hazardous area.
04. Following graph was plotted between V and I values. What would be the values of $\frac{V}{I}$ ratios when the potential difference is 0.8V and 12V.



Ans. :

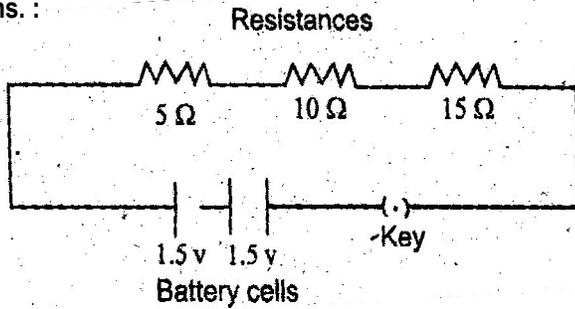
01. $V = 0.5\text{Volt}$; $I = 0.2$ ampere ; $R = \frac{V}{I} = \frac{0.5}{0.2}$; **$R = 2.5\Omega$**
02. $V = 1\text{Volt}$; $I = 0.4$ ampere ; $R = \frac{V}{I} = \frac{1.0}{0.4}$; **$R = 2.5\Omega$**
03. $V = 1.5\text{Volt}$; $I = 0.6$ ampere ; $R = \frac{V}{I} = \frac{1.5}{0.6}$; **$R = 2.5\Omega$**

The above calculation clearly states that the resistance of the circuit is 2.5ohm. This electric circuit obeys ohm's law.

Therefore the values of $\frac{V}{I}$ ratio is constant and it is 2.5ohm.

05. Draw the schematic diagram of an electric circuit consisting of a battery of two cells 1.5V each, three resistance 5ohm, 10ohm and 15ohm respectively and a plug key all connected in series.

Ans. :



06. Complete the table choosing the right terms from within the brackets.

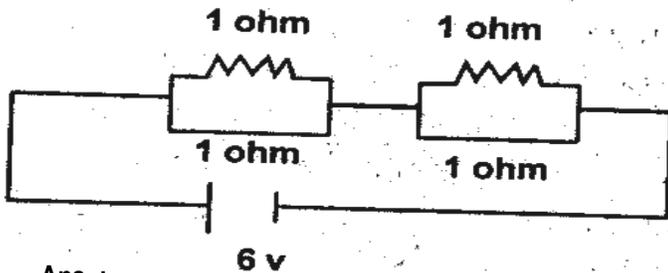
(Zinc, Copper, Carbon, Lead, Lead Oxide, Aluminium)

+ve electrode	Daniel Cell	
-ve electrode	Leclanche Cell	

Ans. :

+ve electrode	Daniel Cell	Copper
-ve electrode	Leclanche Cell	Zinc

07. Observe the circuit given below and find the resistance across AB



Ans. :

The resistance across AB = Sum of resistance $R_1 + R_2$

Resistance in parallel (R_1) = $\frac{1}{R_1} = \frac{1}{1} + \frac{1}{1}$;

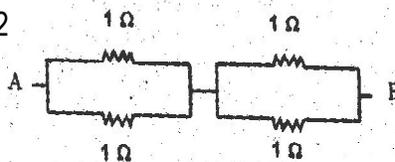
$$\frac{1}{R_1} = 2$$

$$(R_1) = \frac{1}{2} \Omega$$

Another parallel combination resistance (R_2)

$$\frac{1}{R_2} = \frac{1}{1} + \frac{1}{1}; \frac{1}{R_2} = 2$$

$$(R_2) = \frac{1}{2} \Omega$$



The resistance across AB i.e series $R_s = R_1 + R_2$

$$= \frac{1}{2} + \frac{1}{2}; 1 \Omega$$

The resistance across AB = 1Ω

08. We know that γ - rays are harmful radiations emitted by natural radioactive substances.

- Which are other radiations from such substances?
- Tabulate the following statements as applicable to each of the above radiations.

- They are electromagnetic radiation.
- They have high penetrating power
- They are electrons
- They contain neutrons

Ans. :

α - Rays	β - Rays	γ - Rays
They contain neutrons	They are electrons	They are electromagnetic radiation. They have high penetrating power

09. Fill in the blanks:

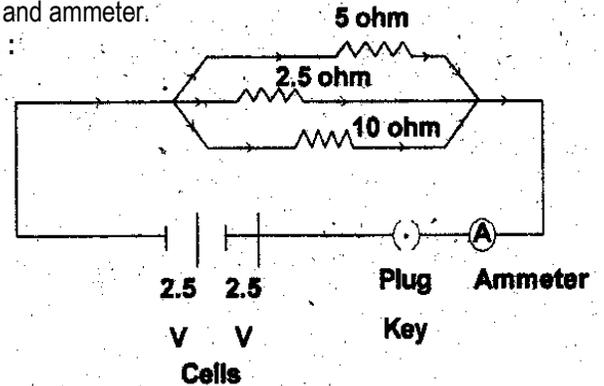
- Potential difference: Voltmeter, then: Current ...
- Power Plant : Conventional Sources of energy: Solar cells

Ans. :

- Potential difference: Voltmeter, then: Current : **Ammeter**
- Power Plant : Conventional Sources of energy: Solar cells : **Solar energy from Sun**

10. Draw the schematic diagram of an electric circuit consisting of a battery of two cells of 2.5v each, three resistance and of 5 ohm, 2.5ohm and 10ohm respectively in parallel and plug key and ammeter.

Ans. :



11. A current of 0.2A is drawn from a filament of an electric bulbs for 5 minutes. Find the amount of electric charge that flows through the circuit.

Ans. : Current (I) = 0.2A ; time (t) = 5 minutes
= 5 x 60 = 300 seconds

$$\text{Charge (Q)} = I \times t$$

$$= 0.2 \times 300; = 60 \text{coulomb}$$

The amount of electric charge = 60 coulomb

12. Fill in the blanks.

- A fuse wire has resistance and melting point.
- The cells from which the electric energy derived by chemical reactions are called cells.

Ans. :

- A fuse wire has **high** resistance and **low** melting point.

- b. The cells from which the electric energy derived by **irreversible** chemical reactions are called **primary** cells.
13. The phenomenon of radioactivity was discovered by Hendry Becquerel in 1986. Raise question on radioactivity
-
 -
 -
 -
- Ans. :**
- What is meant by radioactivity?
 - Name two radioactive elements.
 - Which ray has high Penetration power?
 - Is it affected by temperature and pressure?

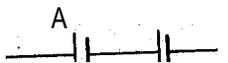
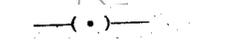
14. How much work is done in moving a charge of 4 coulomb across two points having a potential difference of 12 V?
- Ans. :** Charge(Q) = 4 coulomb
 Potential difference (v) = 12V
 The amount of work done(w) = V x Q
 W = 4 x 12 ; = 48J
 Work done (w) = 48J

15. Match A with B
- | | |
|--------------------------|------------|
| A | B |
| 01. Potential Difference | a. Coulomb |
| 02. Current | b. Volt |
| 03. Charge | c. Ohm |
| 04. Resistance | d. Ampere |

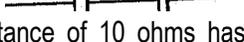
- Ans. :**
- | | |
|--------------------------|------------|
| A | B |
| 01. Potential Difference | a. Volt |
| 02. Current | b. Ampere |
| 03. Charge | c. Coulomb |
| 04. Resistance | d. Ohm |

16. Correct the following statements:
- The nuclear fission reactions are known as the thermonuclear reactions.
 - The nuclear fission reactions are carried out at very low temperature.

Ans. : a. **Nuclear fusion** reactions are known as the thermonuclear reactions.
 b. The nuclear fission reactions are carried out at very **high** temperature of 10⁷k

17. Match A with B
- | | |
|---|---------------|
| A | B |
| 01.  | a. Resistance |
| 02.  | b. LED |
| 03.  | c. Plug Key |
| 04.  | d. Battery |

Ans. :

- | | |
|--|---------------|
| A | B |
| 01.  | a. Resistance |
| 02.  | b. LED |
| 03.  | c. Plug Key |
| 04.  | d. Battery |

18. A resistance of 10 ohms has a current of 5 amperes flowing in it. What is the potential difference between its ends.
- Ans. :** Resistance (R) = 10Ω
 Current(I) = 5 ampere ; Potential difference(v) = ?
 V = IR ; = 5 x 10 ; = 50V ; Potential Difference(v) = 50V

MAGNETIC EFFECT OF ELECTRIC CURRENT & LIGHT

01 MARK QUESTIONS

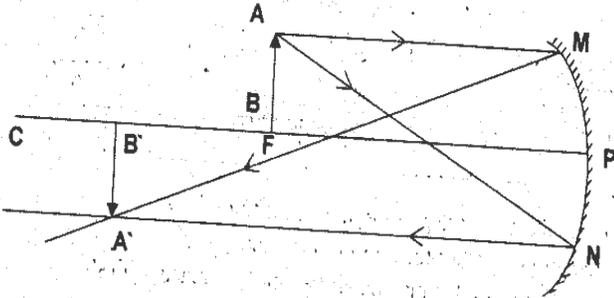
- Electric power can be transmitted over long distance without much loss of energy is an important advantage of
- The field of view is maximum for
- Magnetic field is produced by the flow of current in a straight wire. This phenomenon was discovered by.....
- Which one of the following enhances the power of electric motor?
- Which one of the following is used in rear view mirrors?
- Which one of the following is employed to produce large currents commercially?
- An object is placed 25cm from a convex lens whose focal length is 10cm. The image distance is
- The magnification produced by a mirror is 1/3, then the type of mirror is
- An electric motor working on AC does not require ...
- A device that reverse the direction of flow of current is (armature, brushes, commutator, electromagnet)
- Amirror or lens has a negative focal length.



02 MARKS QUESTIONS

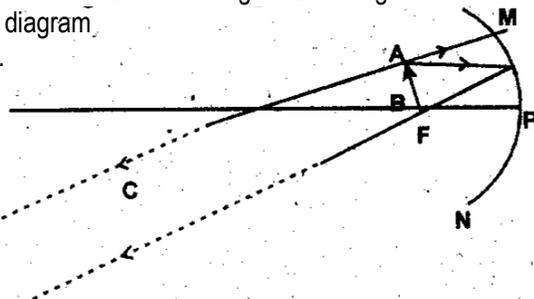
01. The ray diagram shown below is introduced to show how a concave mirror forms an image A'B' of an object AB placed at F.

- Identify the mistakes and draw the correct ray diagram.
- Write the justification for your corrections.



Ans. : Concave mirror forms an image A'B' of an object AB placed at F.

- The mistakes the image A'B' is as given in the diagram.
-



When the object is placed at F, the position of the image is at infinity. The image is highly enlarged and it is real and inverted.

Because the ray parallel to principal axis after reflection will pass through principal focus of the concave mirror. The ray passed through centre of curvature after reflection is reflected back along the same path. So the image will be at infinity.

02. The speed of light in vacuum is $3 \times 10^8 \text{ m/s}$. Calculate the

Speed of Light in medium of refractive index $\frac{4}{3}$

[Hint : $\mu = \frac{c}{v}$]

Ans. : $c =$ Speed of light in vacuum $= 3 \times 10^8 \text{ m/s}$

Refractive Index (μ) $= \frac{4}{3}$

Speed of light in medium (v) = ?

$$\mu = \frac{c}{v} ; v = \frac{c}{\mu} ; = \frac{3 \times 10^8 \times 3}{4} ; = \frac{9 \times 10^8}{4} ;$$

$v = 2.25 \times 10^8 \text{ m/s}$

03. Odd one out: a. Myopia, hypermetropia, presbyopia
b. convex mirror, concave mirror, plane mirror, convex lens

Ans. : Odd One: a. **Scurvy**

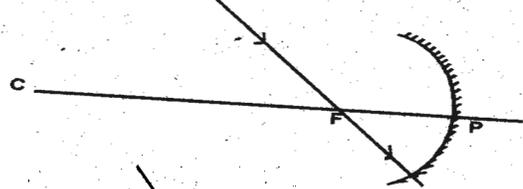
Since myopia, hypermetropia, presbyopia are defects of vision. Whereas scurvy is the vitamin "C" deficiency disease.

b. Convex lens

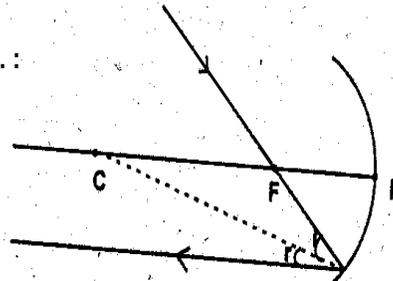
All other mirrors with one spherical surface where as convex lens has two spherical surfaces.

04. The ray diagram shown below is introduced to show how a concave mirror forms an image of an object.

- Identify the mistake and draw the correct ray



Ans. :



05. Correct the mistakes if any in the following statements

- Magnetic field is a quantity that has magnitude only
- The magnetic field lines emerge from the south pole and merge at the north pole.

Ans. : The statements are wrong. The corrected statements are

- Magnetic field is a quantity that has **both** magnitude and **direction**
- The magnetic field lines emerge from the **north pole** and merge at the **south pole**.

06. The focal length of a concave lens is 2m. Calculate the Power of the Lens

Ans. : The focal length of concave lens (f) = 2m

$$\text{Power (P)} = \frac{1}{f} ; \frac{1}{-2} ; = -0.5 ; \mathbf{P = -0.5 \text{ dioptre}}$$

07. Myopia is common refractive defects of vision. Person with this defect can see only nearby objects clearly. Using concave lens of suitable power this defect is correct

- Mention other two types of defects like this.
- Explain how can we correct it?

Ans. : a. i) Hypermetropia (or) farsightedness ii) Presbyopia

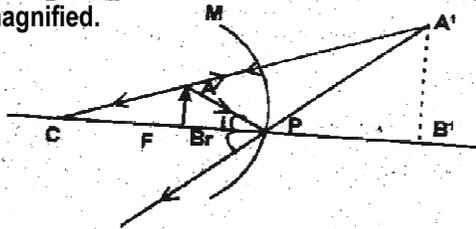
- Hypermetropia is corrected by using convex lens. Presbyopia is corrected by using bifocal lenses.

08. To an astronaut sky appears dark instead of blue. Give reason.

Ans. : The sky appears dark instead of blue to an astronaut because there is no atmosphere containing air (colloid) in the outer space to scatter (tyndall effect) sunlight. As there is no scattering of blue light to reach eyes in the outer space, the sky appears dark.

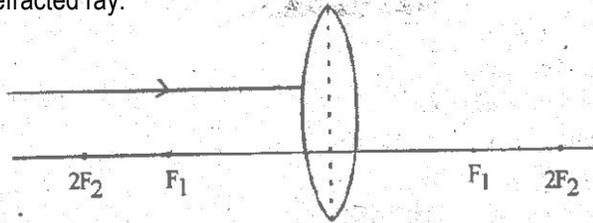
09. Draw ray diagram to show the formation of images by concave mirror when an object is between P and F.

Ans. : When the object is placed between P and F, the image is formed behind the mirror. The image is **virtual, erect and magnified**.

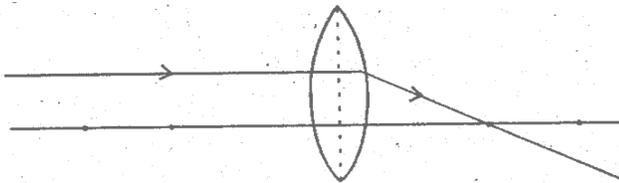


The image is i) behind the mirror ii) virtual iii) erect and iv) enlarged

10. Redraw the given diagram and show the path of the refracted ray.



Ans. : Refracted ray from convex lens:



A ray of light from the object parallel to the principal axis after refraction from a convex lens passes through the principal focus on the other side of the lens.

11. A lens has a focal length of -25cm. What is the power of the lens? It is convex or concave?

Ans. : Focal length(f) = - 25cm

$$\text{Power (P)} = \frac{1}{f} ; \frac{100 \text{ cm}}{f} ; = \frac{100}{-25} ; - 4\text{D}$$

1 dioptre (D) is the power of a lens with focal length 1m

Power of the lens = - 4D. The negative sign indicates that the lens is concave

12. Fill ups.

a. A convex lens forma the image of the sun (at F / beyond 2F)

b. AC generator works on the principle of (Electromagnetic induction / Electrostatic induction)

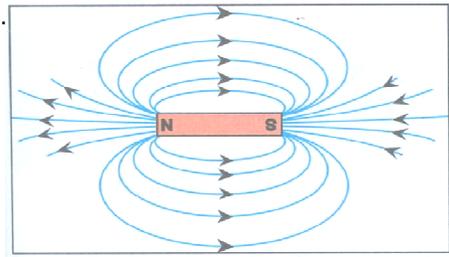
Ans. :

a. A convex lens forma the image of the sun at F

b. AC generator works on the principle of **Electromagnetic induction**

13. Draw a magnetic field lines around a bar magnet and give any two characteristics of lines of force.

Ans. : a.



b. Characteristics of magnetic lines

Magnetic field lines are closed curves

No two field lines are found to cross each other.

14. We see rainbow in the sky after raining. How and why?

Ans. : After raining, a large number of droplets are suspend in the atmosphere and if the sunlight falls over them, **each droplet** acts like a prism and the seven colours of light are **dispersed** and a band of seven colours **VIBGYOR** in formed in the sky. So Rainbow is due **dispersion of sunlight** by droplets.

15. The power of lens is 2.5D. What is its focal length?

Ans. : Power (P) = 2.5D

Focal length (f) = ?

$$P = \frac{1}{f} ; f = \frac{1}{P} ; = \frac{1}{2.5} ; = 0.4\text{m} ; = 40\text{cm}$$

Focal length of lens = 40cm

16. State Fleming's Left Hand Rule

Ans. : **Fleming's Left Hand Rule:**

The three directions of the current and that of magnet field and force are expressed as follows. Stretch the thumb, fore finger and middle finger of your left hand such that they are mutually perpendicular. If the finger points the direction of the magnetic field, middle finger points in the direction of current then the thumb will point in the direction of motion or force acting on the conductor.

17. **Assertion (A) :**Principle of AC generator and DC generator different

Reason (R) :In AC generator, slit rings are used where as in DC generator split rings (or) commutator is used.

- a. A and R are correct b. A is wrong R is correct
c. R explain A d. A and R are wrong

Ans. : b) A is wrong R is correct

Reason : Principle of AC generator and DC generator are same : In AC generator, slit rings are used where as in DC generator split rings commutator are used.

18. The speed of light in water is $2.25 \times 10^8 \text{m/s}$. If the speed of light in vacuum is $3 \times 10^8 \text{m/s}$. calculate the refractive index of water.

Ans. : Speed of light in water(v) = $2.25 \times 10^8 \text{m/s}$

Speed of light in air(c) = $3 \times 10^8 \text{m/s}$

Refractive index(μ) = $\frac{c}{v}$

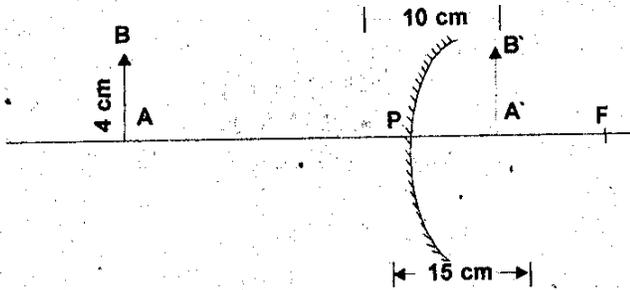
$\mu = \frac{3 \times 10^8}{2.25 \times 10^8} = 1.33$ (No Unit)

Refractive index of water $\mu = 1.33$ (No unit)

05 MARKS QUESTIONS

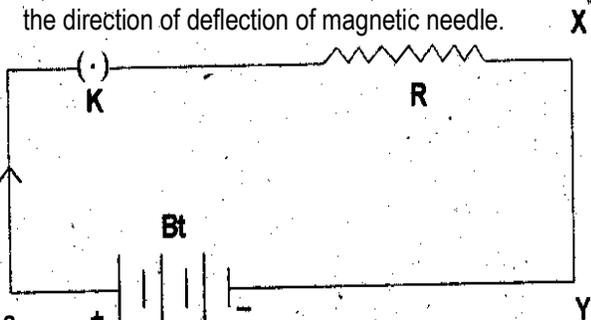
01. a. Observe the figure and write down the following quantities using Cartesian Sign Convention.

- 01. The length of the object AB
- 02. The distance to the image
- 03. The focal length of the spherical mirror

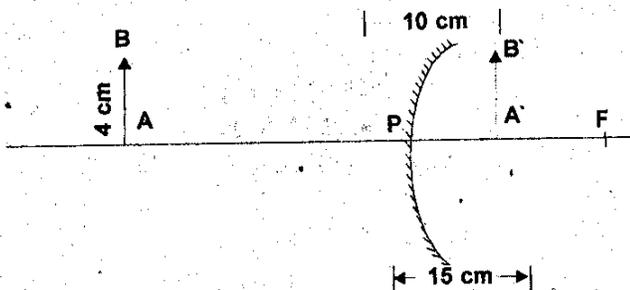


b. Observe the figure and answer the following questions:

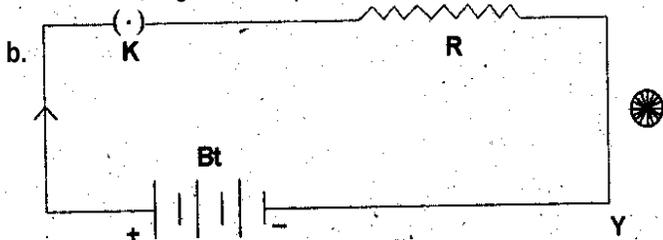
- 01. Why the magnetic needle is deflected?
- 02. If the direction of current is reversed, what will be the direction of deflection of magnetic needle.



Ans: a.



- 01. The length of the object AB = +4cm
- 02. The distance to the image = +10cm
- 03. The focal length of the spherical mirror = +15cm

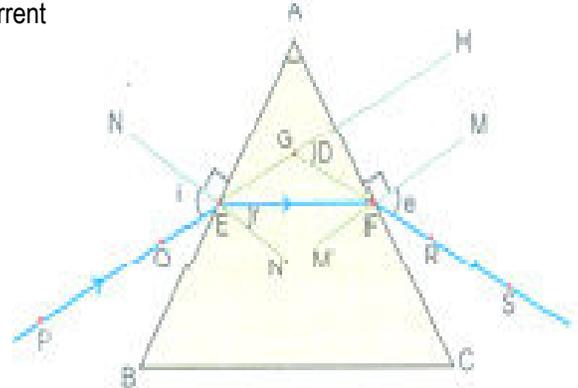


01. Eclctic current through a metallic conductor products a magnetic field around it. If the current flows in one direction (from X to Y) the north pole of the compass needle would move towards the east.

02. If the current flows in opposite direction (from Y to X) . We can see that the needle moves in opposite direction, that is towards the west.

It means that the direction of magnetic field produced by the electric current depends upon the direction of flow of current

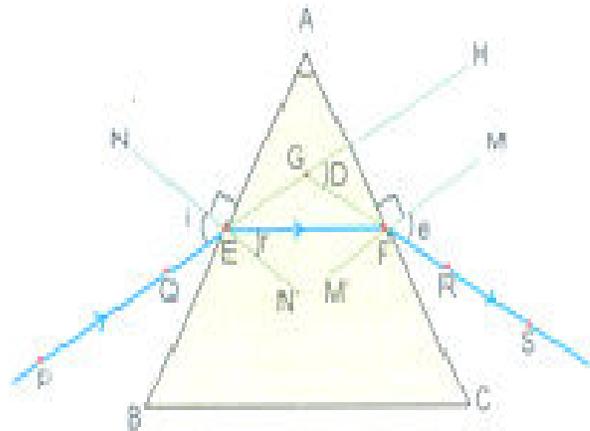
02. a.



Copy the diagram and label the following given below

- i) Incident Ray
- ii) Refracted Ray
- iii) Emergent Ray
- iv) Angle of refraction
- v) Angle of deviation
- vi) Angle of emergence

b. The refractive index of diamond is 2.42. What is the meaning of this statement in relation to speed of light?



- PE – Incident ray
- EF – Refracted ray
- FS – Emergent ray
- $\angle i$ – Angle of incident
- $\angle r$ – Angle of refraction
- $\angle e$ – Angle of emergence
- $\angle A$ – Angle of the Prism
- $\angle D$ – Angle of deviation

b. Speed of light = $3 \times 10^8 \text{ms}^{-1}$

Refractive index of diamond (μ) = 2.42 (No unit)

Refractive index of the medium is given by

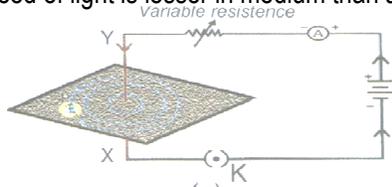
$$\mu = \frac{\text{Speed of light in air}}{\text{Speed of light in medium C (Diamond)}}$$

$$\mu = \frac{3 \times 10^8}{2.42}; = 1.23 \times 10^8 \text{ms}^{-1}$$

The speed of light in diamond = $1.23 \times 10^8 \text{ms}^{-1}$

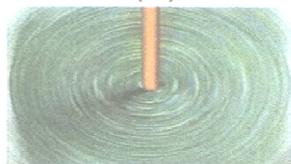
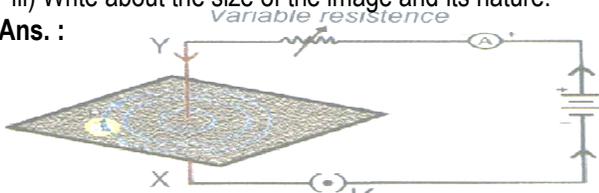
The speed of light is lesser in medium than air i.s $V < C$

03. a.



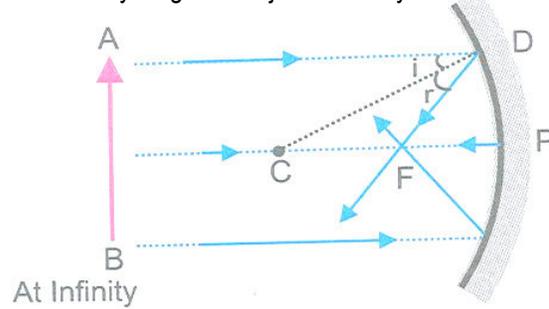
- i) What do those concentric circles represent?
 - ii) How can we find the direction of the magnetic field?
 - iii) Does the direction of the magnetic field lines gets reversed if the direction of current through the straight copper wire is reversed?
- b. i) Draw a ray diagram for an object placed at infinity before a concave mirror.
- ii) What is the position of the image?
 - iii) Write about the size of the image and its nature.

Ans. :



- i) The concentric circles represents the magnetic field lines.
- ii) place a compass at a point over a circle. Observe the direction of the needle . The direction of the north pole of the compass needle would give the direction of field lines produced by the electric current through the straight wire. The direction is shown by an arrow.
- iii) Yes, the direction of current through the straight copper wire is reversed, the direction of magnetic field lines gets reversed.

c. Ray diagram: Object at infinity of a concave mirror

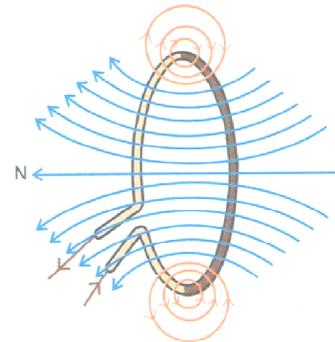


- i) When the object is at infinity of a concave mirror, the image is formed at focus F_2
- ii) The size of the image is highly diminished, point sized. The image is real and inverted.

04. a. i) Draw a ray diagram for an object placed beyond $2F_1$

- ii) What is the position of the image?
- iii) Mention the size and nature of the image.

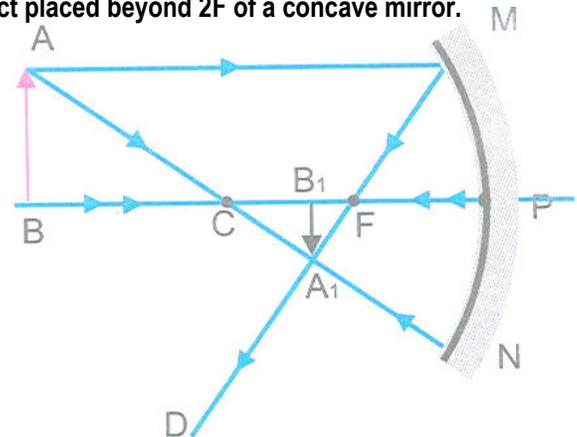
b.



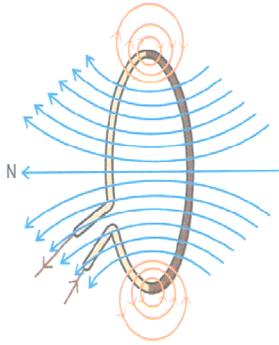
- i) How would the magnetic field lines look like when current is passed through a circular loop?
- ii) Near the centre of the circular loop how the magnetic field lines appears?
- iii) What will happen to the field if the circular coil having turns increases?

Ans. : i) Ray diagram

Object placed beyond $2F$ of a concave mirror.



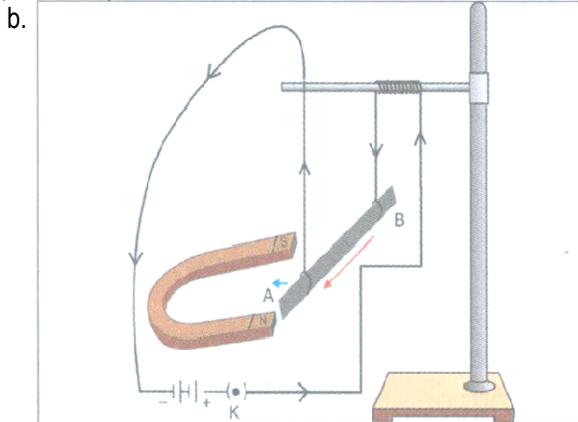
- b.
- i) At every point of a current carrying circular loop, the concentric circles representing the magnetic field around it.
 - ii) When we reach the centre of the circular loop, the arcs of these big circles would appear as straight lines.



iii) Magnetic field produced by a current carrying conductor at a given point depends directly on the current passing through it. Therefore, if there is a circular coil having 'n' turns, the field produced is 'n' times as large as produced by a single turn. This is because the current in each circular turn has the same direction and the field due to each turn then adds up.

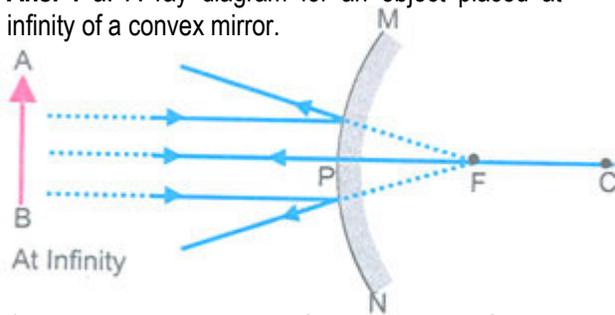
05. a. i) Draw a ray diagram for an object placed at infinity by a convex mirror

- ii) What the position of the image?
- iii) Write about the size and nature of the image.
- iv) Write any two uses of convex mirror.



- i) When a current is passed through the aluminium rod, What do you observe?
- ii) After reversing the direction of current flow, What do you observe?
- iii) State your conclusions.

Ans. : a. A ray diagram for an object placed at infinity of a convex mirror.

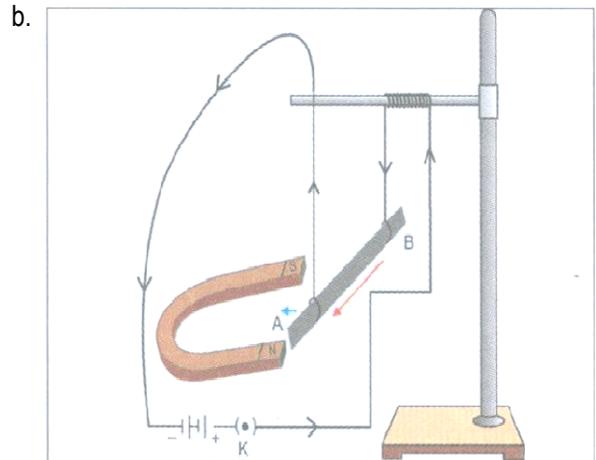


1. When the object is at infinity, the image formed by the convex mirror is at focus F1

2. The size of the image is highly diminished point sized. The image is virtual and erect

3. Uses of convex mirror:

They are used as rear view mirrors in vehicles. They are used in shopping mall to view a larger area.



i) When a current is passed through the aluminium rod, it is observed that the rod is displaced towards the left. The rod gets displaced.

ii) When the direction of current is reversed the rod is displaced towards the right.

iii. Conclusion:

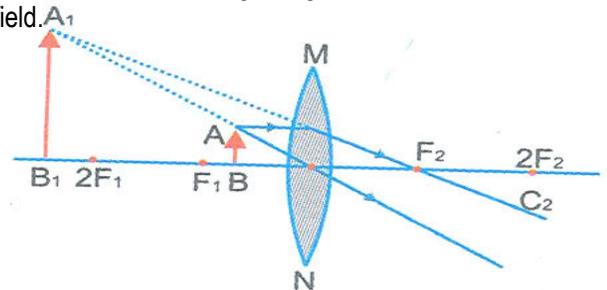
The displacement of the rod in the above activity suggests that a force is exerted on the current carrying aluminium rod when it is placed in a magnetic field.

It also suggested that the direction of force is also reversed when the direction of current through the conductor is reversed.

It shows that the direction of force on the conductor depends upon the direction of current and the direction of magnetic field.

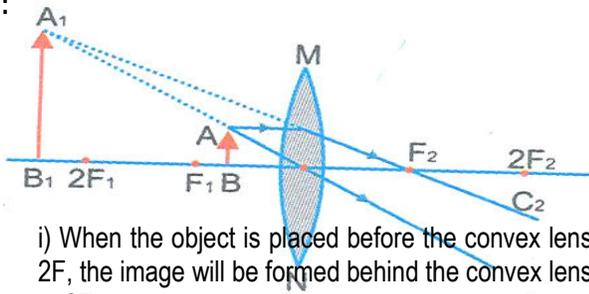
It proves that the displacement of the rod is largest when the direction of the current is at right angles to the direction of magnetic field.

06. a



- i) What is the position of the image?
- ii) Write the size and nature of the image.
- iii) Define the power of lens.
- iv) Explain about the construction of Electric motor

Ans. :



- i) When the object is placed before the convex lens $2F$, the image will be formed behind the convex lens at $2F$.
- ii) The size of the image is same and it is a real and inverted image.
- iii) The power of a lens is defined as the reciprocal of its focal length

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

The SI unit of Power of lens is diopetre (D)

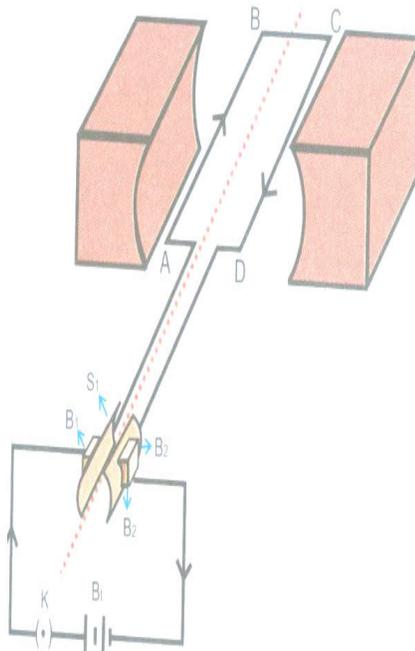
b. Electric Motor

An electric motor is a rotating device that converts electrical energy into mechanical energy.

An electric motor consists of a rectangular coil ABCD of insulated copper wire. The coil is placed between two poles of a magnetic field such that the arm AB and CD are perpendicular to the direction of magnetic field.

The ends of the coil are connected to the two halves S_1 and S_2 of the splitting.

The inner side of those halves insulated and attached to an axle. The external conducting edges of S_1 and S_2 touch two conducting stationary brushes B_1 and B_2 respectively.



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