01.**Effects of Electric Current**

Content

Electrical equipment and their energy Change

Thermal effect of electric current

Arrangement of resistors in circuits

Saftyfuse

The light effect of an electric current

Electrical equipment and their energy Change

1. Find the relation and fill it out

   (a) Washing machine: Mechanical Effect

      Electric Iron Box: --------------------

   (b) When charging a mobile phone :Electricity Converts chemical energy

      When the battery inverter is

      working :-----------------------------------

   Answers: (a)Heat effect

   (b)Chemical Energy is converted into electricity

2. Find the odd one out?

   (a) Mixi, fan, grinder, electric bulb

   (b) Incandescent bulb, discharge lamp, LED, MCB

   Answers: (a) Electric bulb (Others provide mechanical energy)

   (b) MCB (all other light effects)

Thermal effect of electric current

1. Read the given statements and then write down the ones that are suitable for them in the box below.

   > Nichrome, tungsten filament, fuse wire,
   > LED, MCB, watt hour meter

   (a) Metal used as heating coil in heating equipment.

1

(b) A metal coil that emits light in an incandescent lamp.

(c) An alloy of tin and lead

(d) Bulb that operates at low power without any loss of energy.

(e) An instrument for calculating electrical energy industrially

(f) Device for preventing excessive current from flowing into a circuit

Answer:

(a) Nichrome

(b) Tungsten filament

(c) Fuse wire

(d) LED

(e) watt hour meter

(f) MCB

2. The following is a statement prepared by Jyothymol in order to memorize a formula related to the Joule Law.

<div align="center">"ജൂൾ എന്ന ചൂടൻ ദയങ്കര വിറ്റ് (Vit) ആണ്"</div>

(a) Which formula do you understand for heat?

(b) Given three formulas for heat detection, Which is the wrong formula?

$H = I^2 \times R \times t$

$H = \dfrac{V^2 \times t}{R}$

$H = P^2 \times t$

Answer:

(a) $H = Vit$

(b) $H = P^2 \times t$

3. Calculate the amount of heat produced by 3 A of electricity flowing for half an hour through an electric iron box designed to operate at 230 V?
   Answer: H = Vit , V=230V, I=3A, t=30x60s=1800s
               H = 1242000J

4. Heat generated in an electric current circuit according to Joule's law
   H = $I^2 Rt$ Is. Does the heat increase if the resistance is increased without varying the operating voltage of the device? Explain.

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Answer: No. The current decreases as the resistance increases. The square of the current is very low so the heat is low.
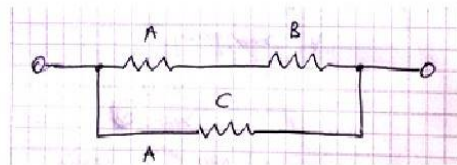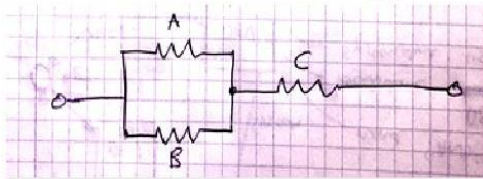
Arrangement of resistors in circuits

(1) If the three 6Ω resistors are connected in any way, to get the given answers how will you arrange the given resistors

      (1) 9 Ω

      (2) 4 Ω

Answer: In the image below $R_1 = R_2 = R_3 = 6$

(2) How many resistors with 176 Ω resistance must be connected in parallel for 5 A current to flow in a 220 V supply?

Answer:

$$R = \frac{V}{I} = \frac{220}{5} = 44 \ \Omega$$

Effective resistance, $R = \frac{R}{n}$

$$44 = \frac{176}{n}$$

$$n = 4$$

Saftyfuse

(1) How is the fuse wire connected to the circuit (series/parallel) ?

Answer: In series

(2) Please read the statements below carefully and then write about which device is being used here?
- Alloy of tin and lead.
- It is a very thin wire
- Protects us and our equipment from the dangers of excessive current.

Answer: Saftyfuse

(3) What are the things to look for when installing a fuse wire circuit in your home?

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Answer:
- ✔ The ends of the fuse wire should be firmly connected in place.
- ✔ Do not project the fuse wire out of the carrier base.
- ✔ Make sure that the fuse wire is at the correct amperage.

(1)**Electric Power**

(1) What is the unit of power?

Answer: watt

(2) What is the power of a light bulb running at 230 V if 0.4 A current is flowing through it?

Answer: $P=VI=230\times0.4$

P=92 W

(3) Electric power is the amount of heat consumed by an instrument per unit time, that is, the power of operation, so what are the formulas for seeing power?

Answer: $P=I^2R$

$$P=\frac{V^2}{R}$$

$P=VI$

(2)**The light effect of an electric current**

(1) Nichrome is not used as a filament in incandescent lamps, why not?

Answer: Nichrome wire is incapable of emitting white light when exposed.

(2) Which of the following types of lamps is used for discharge lamps and LEDs?

Discharge lamp	LED

(a) The electrodes are housed inside a glass tube.

(b) Will also operate at low voltage

(c) Light is emitted by an electric discharge that takes place inside a glass filled with gas.

(d) Gas molecules achieve high energy levels when given a high potential difference.

(e) Low power consumption

4

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(f) Increased efficiency

(g) When these molecules reach normal energy levels and become stable, they emit radioactive energy.

(h) Low energy consumption

Answer:

Discharge lamp	LED
(a)The electrodes are housed inside a glass tube. (c) Light is emitted by an electric discharge that takes place inside a glass filled with gas. (d)Gas molecules achieve high energy levels when given a high potential difference. (g) When these molecules reach normal energy levels and become stable, they emit radioactive energy.	(b) Will also operate at low voltage (e) Low power consumption (f)Increased efficiency (h)Low energy consumption

(3) What is the change in the light of a bulb if the broken filament parts of a bulb are reassembled and illuminated?

Answer: The length of the filament decreases. Hence the resistance decreases and the current increases. This increases the power of the bulb and the light coming from it.

5

02.Electromagnetic effect

Content

1. **Magnetic field**

   (1) What are the main differences between the magnets given in the figure?

ചിത്രം 2.1   പച്ചിരുമ്പുകോർ
                                  ചിത്രം 2.2
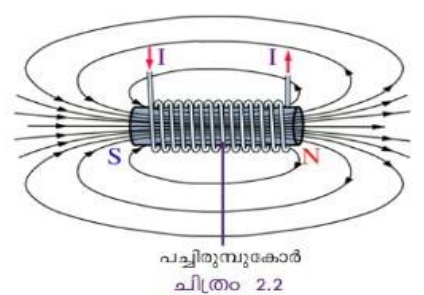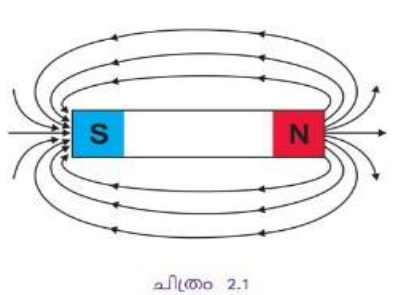
Answer:

| Barmagnet	Electromagnet
● The magnetism of Barmagnet is constant ● The polarity of Barmagnet is constant ● Bar magnet is rectangular	● The magnetism of the electromagnet can vary ● The polarity of the electromagnet changes with the direction of the current ● Electromagnets can be made in many forms

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(2) Electric current flows from south to north through a conductor at the bottom of an independent magnetic needle.

    I. In which direction does the north pole of the magnetic field turn?

    II. By what law did you come to this conclusion?

    III. State the law?

    IV. What is your guess about the deflection of the magnetic needle if the current through the conductor is east-west? Explain the reason.

Answer:

    I. east

    II. Right thumb rule

    III. Assuming that the thumb holds the conductor with the right hand in the direction of the electric current, the other fingers holding the conductor will point in the direction of the magnetic field.

    IV. If the current flows from east to west, the magnetic field will be from south to north, and the compass will be at the north pole

(3) The direction of the magnetic field around the conductor AB, which conducts electricity, is marked.
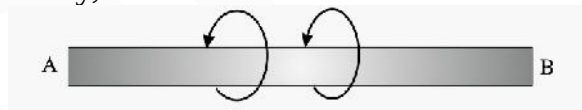
Find and write the electric current direction based on Maxwell's right-hand scroll law?

Answer:

    from B to A

(4) The trajectory of the electrons through a magnetic field is marked. The direction of the force exerted on the electrons by the influence of the magnetic field is inward toward the paper. Is this statement correct? Explain with the help of Fleming's left-handed law.
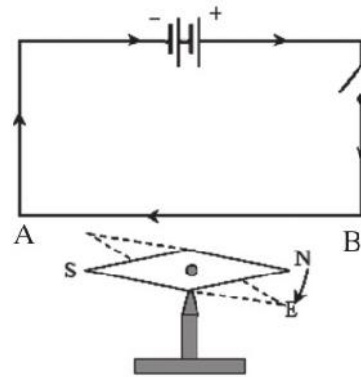
Answer: True, the direction of the magnetic field, the direction of the current, and the direction of the force are perpendicular to each other.

2. **Oersted's Experiment**

    (1) Observe the pictures related to the Oersted's experiment and answer the following questions?

✳✳
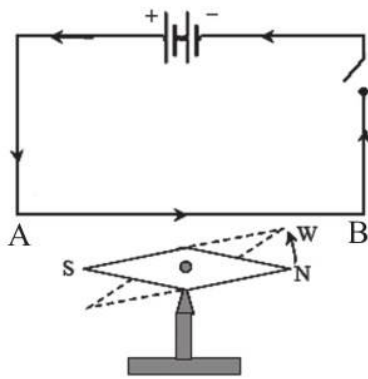
ചിത്രം 2.3 (a)

ചിത്രം 2.3 (b)

i. Complete Table 2.1 by observing the deflection direction of the north pole of the magnetic needle.

No.	Conductor above the magnetic needle	Direction of motion of North Pole (N) of the magnetic needle clockwise/anticlockwise
1	Direction of current from A to B	....
2	Direction of current from B to A	....

ii. In which direction will the current flow along the electrons in the conductor from the current direction A to B?

iii. Repeat the experiment by placing the conductor below the magnetic needle and write the observation in Table 2.2.
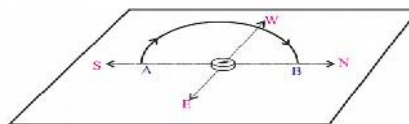
Answer:

i.

✲✲

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No.	Conductor above the magnetic needle	Direction of motion of North Pole (N) of the magnetic needle clockwise/anticlockwise
1	Direction of current from A to B	......anticlockwise...............
2	Direction of current from B to A	clockwise

ii.   From B to A
iii.

| No.	Conductorbelow; the magnetic needle	Direction of motion of North Pole (N) of the magnetic needle clockwise/anticlockwise
1	Direction of current from A to B	.....clockwise........................
2	Direction of current from B to A	anticlockwise

3. **A magnetic field is formed around a conductor of electricity.**

(1) Notice that the conductor is oriented in a southerly direction in an experiment related to the intensity of the magnetic field surrounding the conductor. Why is this necessary?

Answer: The magnetic needle then moves freely so that the influence of the Earth's magnetic field does not affect the magnet.

(2) Given is an image of a shielded conductor AB in a circle. Assume that electricity flows from A to B through this. If so

✳✳✳
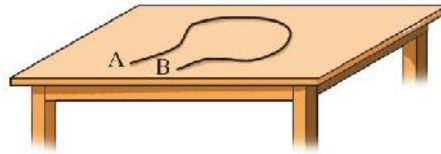
(a) What is the direction of flow of electrons in conductor AB?

(b) Can the direction of the magnetic field around the conductor AB be found? State the law that supports this.

(c) Explain how to find the direction of the magnetic field inside a coil.

Answer:

(a) from B to A

(b) From the table to the outside.

(c) Assuming the right hand holds the conductor in such a way that the thumb moves in the direction of the electric current, the other fingers holding the conductor in the direction of the current will be in the direction of the magnetic field.

(3) Insert the conductor through a piece of cardboard and arrange it vertically as shown in Figure 2.4. The parts that pass through the cardboard are marked with X and Y.
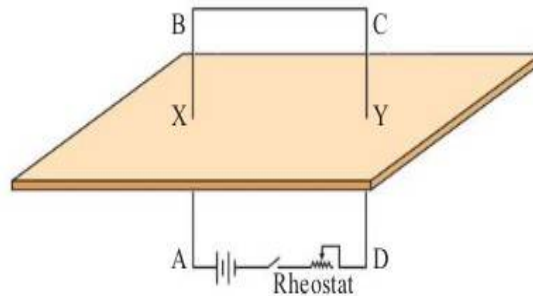
Complete the following worksheet by marking the direction of the magnetic field when the current flows through the conductor at points around point X on the cardboard with the help of a magnetic compass.

(a) Is the current in the circuit between A and B from A to B or from B to A?

(b) Observe the north pole of the magnetic compass and see if the magnetic field line around X is clockwise or Anticlockwise.

10

Answer:

(a) From A to B

(b) Anticlockwise

4. **Maxwell's right hand finger rule for James Clerk.**

(1) Assuming that the............holds the conductor in the direction of the electric current, the ....holding the conductor will point in the direction of the magnetic field.

Answer: Assuming that the thumb holds the conductor in the direction of the electric current, the other fingers holding the conductor will point in the direction of the magnetic field.

5. **Loop conductor**

(1) Observe the picture and write the answer

ചിത്രം 2.6
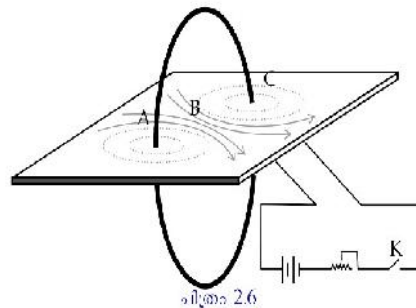
(a) Aren't the magnetic field lines in the same direction in the loop?

(b) What is the difference in the direction of the magnetic field lines when the electric current to the loop is reversed?

(c) How are the magnetic field lines marked when the vibrator observes the current flowing in a clockwise direction?

(d) Are the magnetic field lines visible if the current is anticlockwise?

Answer:

(a) Yes.

(b) And vice versa.

✳✳✳

(c) Into the coil

(d) out of the coil

6. **Solenoid**

(1)

   (a) What is a solenoid?

   (b) If we kept a soft iron core inside the coil, What is the name of this device?

   (c) Examine the magnetism at both ends of the solenoid with the help of a magnetic compass.

   (d) What is the change in the motion of the compass needle if the soft iron inside the solenoid is replaced by an experiment?

   Answer:

   (a) The solenoid is a spiral-shaped insulated copper wire.

   (b) Electromagnet.

   (c) If the current in the solenoid is in a clockwise direction, then the apex will be at the south pole and when the current is flowing in the anticlockwise direction, the apex will be at the north pole.

   (d) As the strength of the magnetic field decreases, so does the motion of the magnetic field.

(2) How to find the polarity of the transmission of electricity through a solenoid? Suggest ways to increase the magnetic field around the electrolytic solenoid.

   Answer:

   If the current is in the clockwise direction when the solenoid is flowing from one end to the other, then the apex will be the south pole and the apex will be the north pole when the current flows in the anticlockwise direction.

   i. Increase the number of rounds

   ii. Increase the current

   iii. Increase the thickness of the core inside the solenoid

(3) Electric current flows through a solenoid that is too long. Find the correct magnitude of the magnetic field inside the solenoid and write it down.

   (a) Will be zero

   (b) Will be the same amount at all points
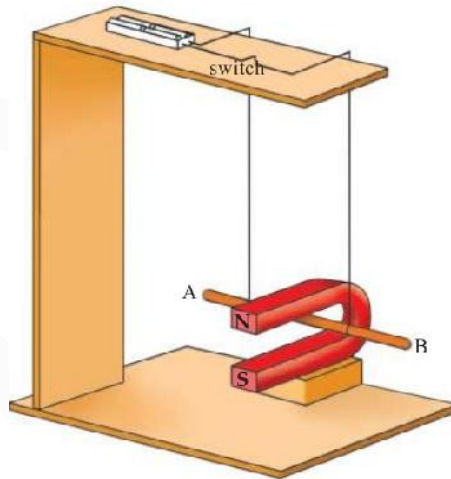
✳✳✳

(c) It gradually decreases as it reaches the edges

(d) Gradually increasing as it reaches the edges.

Answer:

(b) Will be the same amount at all points

7. **Utilization of the magnetic field of electricity**

(1)

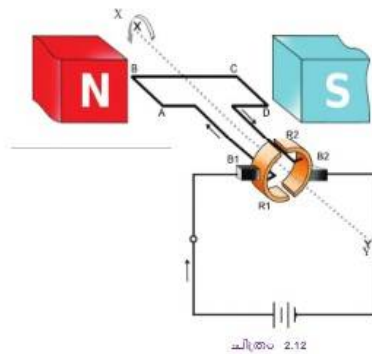**Observe the picture above and answer the following questions?**

(a) Does the conductor not move when the switch is turned on?

(b) Which direction is it going?

(c) What factors influence the direction of motion of a conductor?

Answer:

(a) yes

(b) According to Fleming's left-handed law, the index finger points to the magnetic field (N to S), the current going from A to B, and the force exerted on the conductor by the current into the U - shaped magnet.

(c)   i. Electric current intensity

ii. The direction of the magnetic field

8. **Electric motor**

(1)

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ചിത്രം 2.12

Given a picture of an electric motor, observe the picture and write the parts?
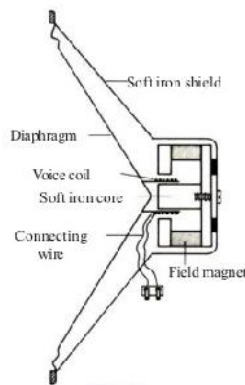**Answer:**

    i. **N, S**   - Magnetic poles

    ii. **XY**   - The axis of rotation of the motor

    iii.**ABCD**   - Armature

    iv. B_1, B_2 - Graphite brushes

    v. R_1, R_2 **- Split rings**

(2) Identify which device has the following specifications?

    "In order for the motor to continue to rotate, the current in the armature must be constantly changing. It helps to change the current in the circuit after each half-rotation."

    Answer: Split ring commutator

9. **Moving coil loudspeaker**

Fig. 2.13

✳✳

(1) Check in to the structure of the loudspeaker and then answer the following questions?

    (a) Where the Voice coil is located

    (b) To which part of the diaphragm is it connected?

    (c) Where does the current to the voice coil come from?

    (d) What happens when electricity flows through the voice coil?

    Answer:

    (a) In the magnetic field

    (b) With voice coil

    (c) From the microphone

    (d) The motor principle is the vibration of the voice coil, followed by the vibration of the diaphragm and the sound.

03 :Electromagnetic induction

Content

Electromagnetic induction

AC Generator & DC Generator

Mutual Induction & Transformer

Self Induction

Indicator

Moving Coil microphone

Power Transmission and Distribution

House Electrification

MCB & ELCB

Thripin plugin and earthing

Electric shock

1. **Electromagnetic induction**

(1) What are the names of any devices that operate on the principle of electromagnetic induction?

Answer:

➢ Generator
➢ Moving Coil microphone
➢ Transformer
➢ Inductor

(2) If the power received from the cell is in the same direction and the same amount, then what are the characteristics of the power received by electromagnetic induction?

Answer:

(a) The direction is changing
(b) Quantitative changing

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(3) What elements are needed to prove electromagnetic induction experimentally?

Answer: Magnets, conductors, galvanometers, connecting wires

(4) The two ends of a conductor mounted horizontally in a southerly direction are connected to a galvanometer. The conductor is located in a magnetic field that operates in an east-west direction. In which direction should the conductor move if there is to be a maximum current flow in the south-north direction through the conductor.

(a) In an easterly direction

(b) Down

(c) To the top

(d) In a northerly direction

Answer: Down, Fleming's right hand

2. **AC Generator & DC Generator**

(1) Which device is used to generate electricity?

I. Generator

II. Galvanometer

III.   Motor
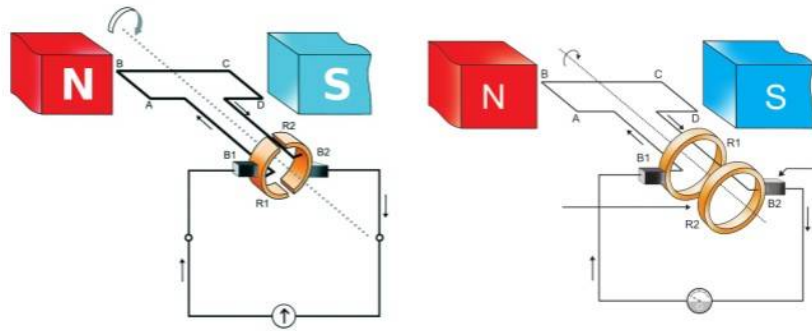
IV.   Ammeter

Answer:
Generator

(2) There is only one type of generator - AC generator, - write your response to this statement.
Answer: This is not true, but the armature generated by both of these is
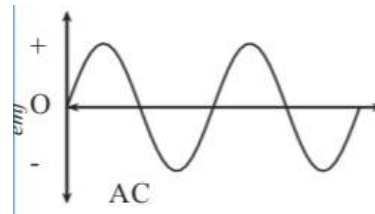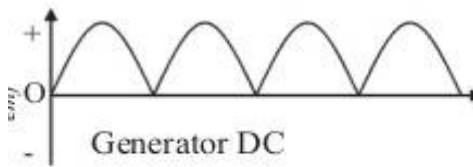ac current

(3) Below are two diagrams of the generator.

✳✳✳

(a) If the armature of both rotates, what is the specific current of the galvanometer?

(b) If the field magnet of both rotates, what is the difference of the current obtained in the galvanometer?

(c) Draw a graph of the power available in both cases

Answer:

(a) Figure 1 shows DC and Figure 2 shows AC

(b) AC

(c)

(4) Complete Table 3.7 with formula $\dfrac{V_S}{V_P} = \dfrac{N_S}{N_P}$

Primary coil		Secondary coil	
Number of turns N_P	Voltage V_P	Number of turns N_S	Voltage V_S
500	10 V	2500	……..
……..	100 V	800	25 V
600	………	1800	120 V
12000	240 V	……..	12 V

18

✶✶

Answer:

Primary coil		Secondary coil	
Number of turns N_P	Voltage V_P	Number of turns N_S	Voltage V_S
500	10 V	2500	50v.......
....	100 V	800	25 V
600	40v....	1800	120 V
12000	240 V	600	12 V

(5) A transformer operating at 240 V input voltage has 80 circuits in the secondary and 800 circuits in the primary. What is the output voltage of this transformer?

Answer: V_P= 240 V
N_S =80
N_P= 800
$$\frac{N_S}{N_P}=\frac{V_S}{V_P}$$
$$\frac{80}{800}=\frac{V_S}{240\,V}$$
$$V_S= \frac{80\times240}{800}=24\,V$$

(6) Classify the following connections by connecting them to a step-up / step-down transformer.
(a) $V_S>V_P$
(b) $I_S>I_P$
(c) $V_S<V_P$
(d) $\dfrac{N_S}{N_P}<1$
(e) $\dfrac{N_S}{N_P}>1$

Answer:

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Step-up transformer	**StepDown Transformer**
$V_S > V_P$	$V_S < V_P$
$I_S < I_P$	$I_S > I_P$
$\dfrac{N_S}{N_P} > 1$	$\dfrac{N_S}{N_P} < 1$

(7) Write down the structural differences and similarities between an AC generator and a DC generator.
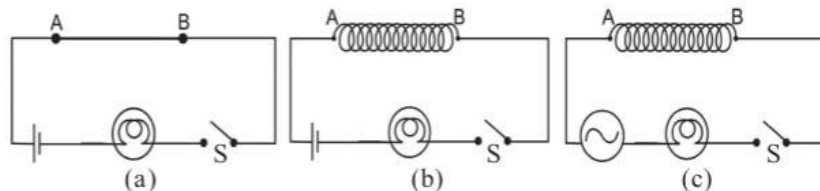
Answer:

Similarities

Armature, field magnet, brushes

Differences

The AC generator has slip rings

Split rings on DC generator

3. **Mutual Induction & Transformer**

(1) Copper wires of the same length and thickness are connected in three identical circuits and to points A and B, respectively. Copper wire is used in circuit (a) without looping and in loop (b) and (c). Observe the circuit and answer the following questions.

(a) What is observed when the switch S is turned on in circuit (a)?

(b) What difference is observed in the light intensity of the bulb when the switch S is turned on in circuit (b)? Justify your answer

(c) What difference is observed between the light intensity of the bulb when the switch S is turned on in circuit (c)? Justify your answer

Answer:

(a) The bulb gives off a good glow

****

(b) The intensity does not change

(c) c The intensity of light decreases because of the back emf

(2) What happens if an electric heater, rated at 1.5 KW-230 V, is connected and operated on a household branch circuit containing 5 amperage fuse? Explain.

Answer: I = P/V = 1500 W/230 V =6.5 A

The amperage of the fuse required for the device is 7 A, and using a 5 A fuse will cause the fuse to melt and burst when the device is started.

4. <u>Self Induction</u>

(1) What is Self Induction?
Answer: The flux fluctuation that occurs when electricity flows through a solenoid produces an emf (back emf) in the opposite direction of the current in the same conductor. This phenomenon is called self induction.

5. <u>Inductor</u>

(1) Answer the following questions related to Indicator?

(a) Indicators are widely used in electronic circuits. What is the need for this?

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

(c) Indicators are not used in dc circuits. Find the cause and write?

Answer:

(a) Power loss can be reduced as required without loss of power.

(b) A lot of electricity will be lost in the heat

(c) Self-induction through the back emf can only be made in a circuit that produces a varying magnetic field, and only in ac. The current flowing in dc is unchanged in magnitude or direction so the inductor behaves only like a conductor.

6. <u>Moving Coil microphone</u>

(1) Write in the correct order what is given in the box regarding the function of the microphone?

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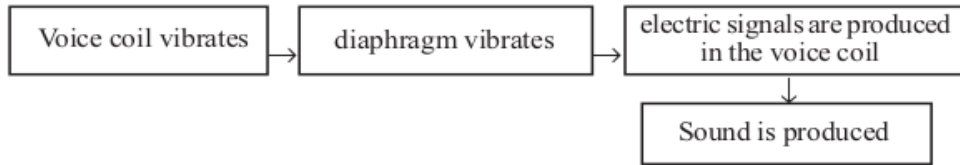
Answer: Noise --- Diaphragm vibrating --- Voice coil vibration - Electrical signals are generated in the voice coil.

7. **Power transmission and distribution**

(1) What are the hierarchical devices used in home electrification?

Answer: Switch, regulator, main fuse, main switch, ELCB ,MCB

(2) What is the average voltage at which power stations in India generate electricity?

Answer: 11 kv(11000v)

(3) When electricity is transmitted to distant places, there is a heat loss in the conductor, what are the ways to reduce this heat loss?

Answer:

    i. Reduce current

    ii. Decrease the resistance of the conductor wire

(4) Where is the step-down transformer used?

Answer: In substations and distribution transformers

(5) Is the same voltage used for domestic and industrial purposes?

Answer: No,

    ◆ 230 V for domestic use

    ◆ 400 V for industrial use

8. **Home Electrification & Watt hour meter**

(1) What are the advantages of the parallel method?

ഉത്തരം:

    i. There will be enough current

    ii. Each device will receive the same voltage

    iii. The equipment will operate according to the recorded power

    iv. The equipment can be controlled at will with a switch.

(2) 1 kWh = ...J

✳✳

Answer: $3.6 \times 10^6 J$

(3) In a house, 5 CF lamps of 20 W for 4 hours and 4 fans of 60 W for 5 hours and 100 W of TV. Works for 4 hours. If so, how many units of usage per meter per day will they record?

Answer:

Energy used by CF lamp = $\dfrac{20\,W \times 5 \times 4\,h}{1000} = \dfrac{400}{1000} = 0.4$

The energy used by the fan = $\dfrac{60 \times 4 \times 5}{1000} = \dfrac{1200}{1000} = 1.2$

Energy used by television = $\dfrac{100 \times 1 \times 4}{1000} = \dfrac{400}{1000} = 0.4$

Total = 0.4 + 1.2 + 0.4 = **2** യൂണിറ്റ്

9. **MCB & ELCB**

(1)

I. What is MCB?

II. What is ELCB?

III.   What is the difference between a normal fuse and an MCB?

IV.   What is the advantage of MCB over Fuse?

V. What is the role of ELCB / RCCB in the circuit?

Answer:

i. The MCB switch automatically disconnects the circuit when there is excessive current in the circuit due to short circuit and overload. In the event of a short circuit, a strong magnetic field builds up in the coil, causing it to trip and the current in the circuit to be cut off.

ii. ii. ELCB helps to ensure that the circuit is disconnected and secured in the event of a current leak in the circuit due to insulation failure or otherwise. Earth wire with ELCB

iii. Will be connected

iv.

Normal fuse	MCB
1. The fuse wire melts and the power goes out. Inspect the circuit and install a new fuse wire 2. The thermal effect of electricity works according to the mind.	1.MCB automatically shuts off. Just check the circuit and turn it on. 2. Acts according to the magnetic effect of electricity.

****

v. <u>Improvement for MCB compared to Fuse</u>

 i. Easy to use
 ii. Easy to restore to old shape
 iii. Self-regulating activity

vi.

➜ ELCB allows the circuit to be disconnected automatically in the event of a current leak in the circuit due to insulation failure or otherwise.

➜ This does not shock those come in contact with the electrical circuit or equipment.

➜ The ELCB is now being replaced by the RCCB, which ensures greater security.

10.   **Thripin plug and earthing**

(1) Thripin plug ensures safety.

(a) With which line does the pin 'E' come in contact?

(b) How is the earth pin different from the other pins? Why is it so different?

(c) To which part of the earth line device is it connected?

Answer:

(a) With the earth line

(b) Earth pin is thicker and longer.

(c) With external circuit.

(2) Why use Thripin plug for some mobile phone chargers?

Answer: Usually all the holes in a socket are sealed with a piece of plastic sheet. All holes will be opened when the pin enters the earthing hole. This is why it is used as a tripod plug with an earthing pin attached to the pins used in the chargers.

(3) What is a rectifier?

Answer: The rectifier is an electrical system that converts AC into DC

11.   **Electric shock**

(1) What are the precautionary measures to be taken to avoid electric shock?

Answer:

****

    i. Do not handle electrical appliances with wet hands

   ii. Do not operate devices with high power in a standard socket

  iii. Make sure the mains switch and ELCB are turned off when making repairs to the household electrical circuit.

   iv. Dont Dry your hair with a table fan

  (2) How to give first aid to an injured person?

Answer:

    1) Disconnect first the power

    2) Give artificial respiration

    3) Heat the body thoroughly

    4) Restore the activity of the heart by pressing hard on the chest

    5) Get to the hospital as soon as possible

****

04. Reflection of light

Content

Reflection of Light

1. The following is that occurs when a light beam strikes two different surfaces.
   i. What is the difference between the surfaces in these figures?
   ii. Do the light rays travel in parallel after the reflection in Figure 4.2 (b)?
   iii. Can a definition by observing Figure 4.2 (a)?

(a) Regular reflection   (b) Irregular reflection
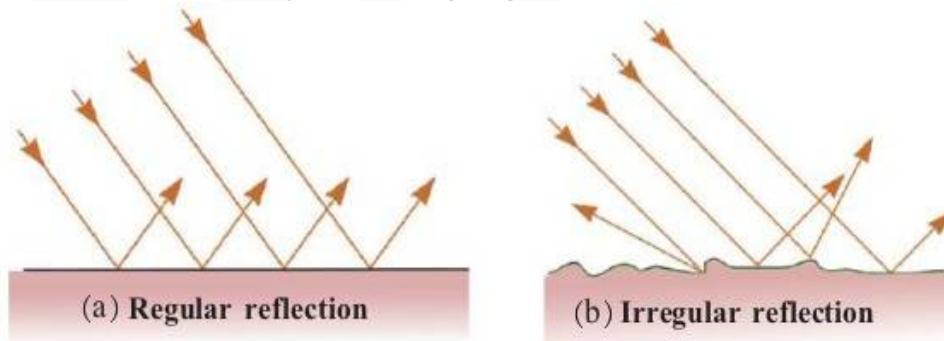
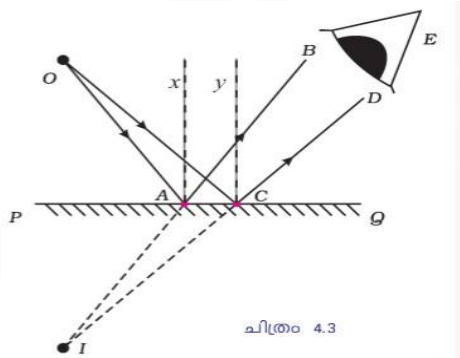**Answer:**

   i. The surface of the first is regular and the second is irregular.
   ii. In the second, after the reflection, the rays respond in different directions.
   iii. When the rays of light fall parallel to a surface in a smooth, the reflectors return in parallel, and such a reaction is called a regular and complete reflection.

image formation on a plane mirror

2. Write a comment on the following features of the images formed here

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(a) The distance from the mirror to the object and the image.

(b) Is the image real or false?

(c) Size of the image?

ചിത്രം 4.3
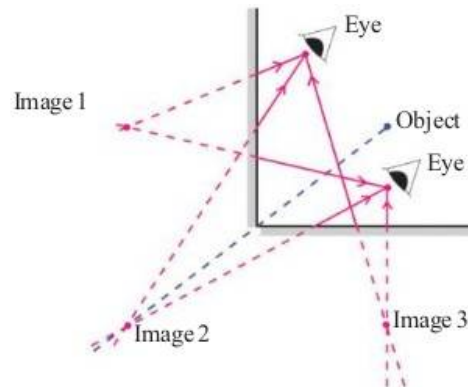
Answer:

(a) same

(b) virtual and erect

(c) same as the size of object

Multiple reflection and image formation

Angle (θ)	Number of images (n)
45	
60	
90	
120	
180	

Table 4.1

3. Arrange the two plane mirrors so that their edges are aligned so as shown in the picture. Light a candle and place it between them. How many image of the candle do you see?

   Answer:

✳✳

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Angle (θ)	Number of images (n)
45	7
60	5
90	3
120	2
180	1

The field-view of the mirrors and the nature of the image

4. What is field-view?

Answer: Field-view is the maximum range of visibility that can be seen through a mirror.

5. Why are convex mirrors used as rear-view mirrors in vehicles?

Answer: The convex mirror is the largest field-view.

Mirror Equation and Focal Length

6. Arrange the materials as shown below and adjust the screen in front of the mirror so that you get a clear reflection of the candle.

ചിത്രം 4.5
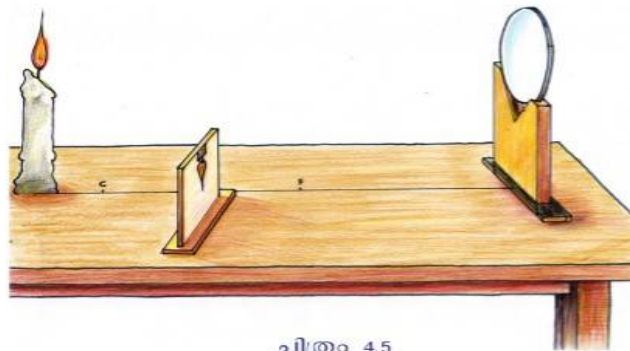
(a) Write the Position of image & characteristics of image?

(b) Observe the position and characteristics of the image obtained when the candle is moved.

****

(c) The distance from the mirror to the object is calculated as u and the distance from the mirror to the image as v is measured and recorded. Change the position of the object and repeat the operation.

Sl. No.	Distance to object u cm	Distance to image v cm	$\dfrac{uv}{u+v}$
1	25		
2	30		
3	40		

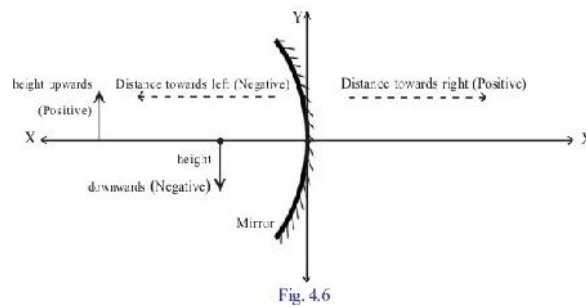average value =

Table 4.4

Answer:

(a) Between C and F, the actual and inverted size is smaller than the object.

Sl. No.	Distance to object u cm	Distance to image v cm	$\dfrac{uv}{u+v}$
1	25	100	20
2	30	60	20
3	40	40	20

average value = 20

Table 4.4

(b) Between C and F, the actual and inverted size is smaller than the object.

(c) Record the dimensions as shown in the figure in neo-cartition mode.

Fig. 4.6

Answer:

1. The distance from the mirror to the object (u) = negative

2. The distance from the mirror to the image (v) = negative

3. size of the object (OB) =negative

✳✳

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4. size of the image (IM) =negative

7. At a distance of 8 cm in front of a concave mirror with a focus distance of 5 cm Putting a property. Find the position and magnification of the image. Draw a diagram of the image representation using a graph paper and find out if the image is vertical or inverted.
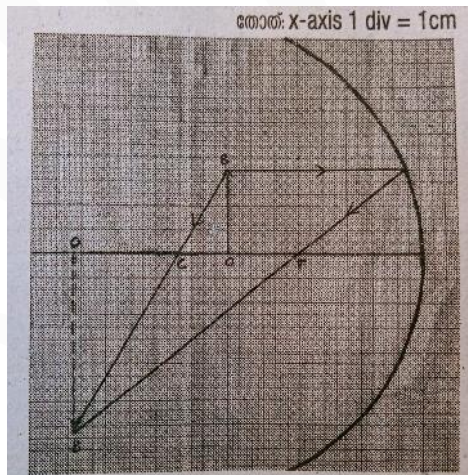
Answer:

$$f = -5\,cm \qquad u = -8\,cm \qquad v = ?$$

$$v = \frac{f \times u}{u - f} \;=\; \frac{-5 \times -8}{-8 - -5} \;=\; \frac{40}{-3} = -13.33\,cm$$

$$\text{magnification} \;=\; -\frac{v}{u} \;=\; \frac{-13.33}{-8} = -1.66 = -1.67$$

The position of the reflection is beyond C

Feature- Upside down, real

തോത്: x-axis 1 div = 1cm

8. A dentist uses a mirror with a focal length of 8 cm to examine the teeth. What is the maximum distance between the tooth and the mirror to see the tooth clearly? Explain the reason for your comment. What kind of spherical mirror is the mirror used by the doctor?

Answer:

➢ 8 cm short
➢ Mirror Concave
➢ The mirror used by the doctor is concave, because it only creates a false and distorted image.

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9. A motorbike passenger sees a rear-facing car 1/6 times its true size in the rearview mirror .If the actual distance between the bike and the car is 30 m, calculate the radius of curvature of the rear-view mirror?

Answer:

$$m=\frac{1}{6} \ , \ u=-30\,m$$

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

$$\frac{1}{6}=\frac{v}{-30}$$

$$v = 5 \text{ m}$$

$$f=\frac{u\times v}{u+v} \ = \ \frac{-30\times 5}{-30+5} \quad \frac{-150}{-25}=6\,m$$

Correlated with the focus and curvature of the mirror,

$R=2f$ In this formula

$R=2\times 6=12m$

10. Someone uses a 72 cm focusing distance shaving mirror 18 cm away from the boutique. How far can his reflection be formed? Is the reflection real or false? What is the magnitude of the reflection? What kind of mirror is this?

Answer:

The shaving mirror is an example of a concave mirror

$$f=-72\,cm \ , \ u=-18\,cm \ , \ v=?$$

$$v=\frac{f\times u}{u-f} \ , \ \frac{-72\times -18}{-18--72} \ = \ \frac{72\times 18}{54}=24\,cm$$

$$m = \ \frac{-v}{u}=\frac{-24}{-18}=1.33$$

11. Wrap a rubber ball 12 cm in diameter, completely wrapped in aluminium foil and turn into a miniaturized surface. Where does the image of an object 12 cm away from the centre of the ball form? Is the reflection real or false?

Answer:

✳✳✳

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Assume that the inside of the ball is glued with aluminium foil so that it acts as a concave mirror.

diameter = - 12 cm,

Half of the radius of curvature

The radius of curvature of the mirror = - 6 cm

$R = -6\,cm$

$f = \dfrac{R}{2} = \dfrac{-6}{2} = -3\,cm$

$u = -12\,cm$

$v = \dfrac{u \times f}{u - f} = \dfrac{-12 \times -3}{-12 - -3} = \dfrac{36}{-9} = -4\,cm$

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05.Refraction of light

Content

Light velocity and luminous density
Refraction of light
Refraction in various media
Prism
Light velocity and refractive index in the medium
Total internal reflection
Lens
Image formation of lens
Magnification
Power of Lens
Atmospheric refraction

1. **Light velocity and Optical density**

   (1) If we consider the speed of light in air to be equal to the speed of light in space, then what is it?

   Answer: Yes, $3 \times 10^8 \frac{m}{s}$

   (2) The refractive indexes of the various substances are given in the table. Find the medium through which light travels the fastest.

   Answer: Water has the lowest refractive index of any given medium.

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(3) Look at the picture. Light rays are depicted in two different media. Which medium has the highest luminous flux? Why?

(a) What is the refractive index of which medium?

Answer:

(a) The medium is one, because the refractive angle differs even though the angle of incidence is the same in both images. In a medium with a higher density, the light beam tends to close closer to the vertical.

(b) The medium is one, and the refractive index of the medium with the optical density is also high.

2. **Refraction of light**

(1) Why does refraction occur?

Answer: Light velocity varies with the Optical density of the medium.

(2) Write refractive laws?

Answer:

i. The angle of inclination, the angle of refraction, and the perpendicular drawn through the point of separation at the intersection plane are the same.

ii. The ratio of the angle of inclination and the angle of refraction is a constant, called the snail law.

(3) Explain why you got the frog when you shot the fish in the picture below.

Answer:

The exact position of the fish cannot be seen because the light emitted from the fish is refracted at the splitting level.

(4) Write down the phenomenon that caused the following situations

i. deepest water sources seems to short depth.

****

ii. It looks like there is water on Tared Road on hot days.

iii. Objects submerged in stagnant water appear to be curved and broken.

iv. The stars seem to be twinkling in the night sky.

v. The sun is seen in the sky for a short time before sunrise and after sunset.

Answer: Refraction

3. **Refraction in various media**

   (1) The speed of light in the air $3 \times 10^8 m/s$, The speed of light in a glass $2 \times 10^8 m/s$ Then see the refractive index of the glass?

Answer:

$$\frac{\text{Speed of light in air}}{\text{Speed of light in glass}} = \frac{3 \times 10^8 \, m/s}{2 \times 10^8 \, m/s} = 1.5$$

   (2) Define the following.

   I. Relative refractive index.

   II. Absolute refractive index.

Answer:

   I. The relative refractive index of one medium relative to another.

   II. it is the ratio of speed of light in vacuum to the speed of of light in that medium

   (3) Below is the absolute refractive index of some of the transparent media in the table,

   i. Find and write the media with the highest light density and the medium with the lowest light density given in the list.

   ii. What is the velocity of light in kerosene if it is the velocity of light in air?

****

Medium	Refractive index
Air	1.0003
Water	1.33
Kerosene	1.44
Turpentine oil	1.47
Crown glass	1.52
Diamond	2.42

iii. When the light beam is inclined from the air to the diamond, does the refractive index close or move away vertically?

iv. The refractive index of a diamond is 2.42. What does this mean? Calculate the speed of light through a diamond.
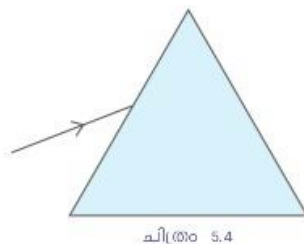
Answer:

i. Most-diamond
   The lowest-air

ii. $n = \dfrac{c}{v}$

   $v = \dfrac{c}{n} = \dfrac{3 \times 10^8}{1.44} = 2.08 \times 10^8 \, m/s$
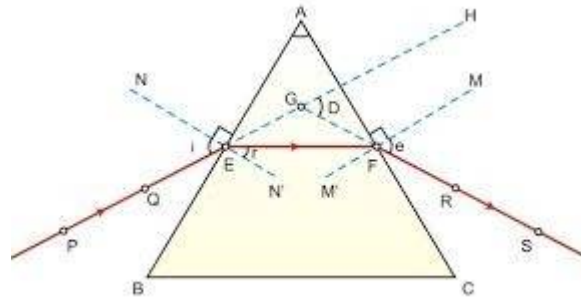
iii. Towards the normal

iv. Light travels through air at 2.42 times the speed of light through a diamond. $n = \dfrac{c}{v}$, $v = \dfrac{c}{n} = \dfrac{3 \times 10^8}{2.42} = 1.24 \times 10^8 \, m/s$

4. **Prism**

Using the given image, can you tell where the light coming from the glass prism is inclined towards?

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Answer:

As you can see from the picture,

PQ = incident angle

EF = Refractive angle

RS = Refractive beam going outwards

➢ When the ray of light tilts from the air to the glass, it touches the vertical.

➢ As it enters the air from the glass, it moves away from the vertical.

5. **Light velocity and refractive index in the medium**

(1) The refractive index of glass and water is given in the table.

a) If velocity is through water, calculate the velocity of light through

Medium	Refractive index (n)
Glass	3/2
Water	4/3

vacuum.

b) Calculate the velocity of light through the glass

Answer:

a) $\frac{c}{v}=n$

Therefore $c=n\times c$ = Refractive index X is the speed of light through water

The speed of light through a vacuum = 1.5 X $2.25/10^8 m/s$

$= 3\times10^8 m/s$

b) $\frac{c}{v}=n$ Here c = $3\times10^8 m/s$, n = 1.5 Hence to see v

$v=\frac{c}{n} = \frac{3\times10^8}{1.5} = 2.25/10^8 m/s$

****

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6. **Total Internal Reflection**

    (1) Given the path of enlightenment through various media. Analyze the pictures and find the answers to the questions.

Fig. 5.3 (a)   Fig. 5.3 (b)

Fig. 5.3 (c)   Fig. 5.3 (d)

Fig. 5.3 (e)
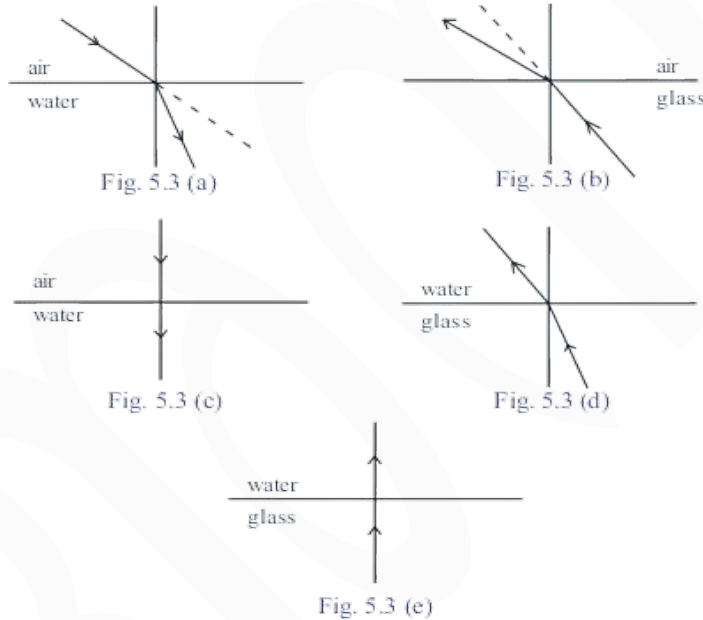
    i. Which of these pictures shows the total internal reflection taking place?
    ii. What is the critical angle of the glass?
    iii. Is there a Total internal Reflection of light falling on the air at an angle of 45^0 degrees from the water? Why?

Answer:

    i. Figure (a), Figure (e)
    ii. 42^0
    iii. No,Total internal reflection can only occur if the angle of inclination is greater than the critical angle.

7. **Total Internal Reflection in daily Life**

    (1) In the picture, why is the bottom of the aquarium reflected on the surface of the water?

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Answer: Total internal Reflection. That is, the light from the bottom hits the surface of the water and catches the eye of the observer so that the bottom can be seen on the surface of the water.

(2) Which object is shown in the picture below?

ചിത്രം 5.10

a) Write the structure of the device shown above?

b) What makes it different from other metal conductors?

Answer:

Optical fibre

a) Light fibres (optical fibres) are made of thin fibres of quartz or glass. On top of this there is a cover with a medium of low luminosity density and a cover of plastic on top of it.

b) 1) Decreased energy loss

2) Signals can be transmitted in the form of light at very fast distances

3) It can send thousands of signals of different frequencies at the same time.

8. **Lens**

(1) Match The following

Terms	Definition
1.Optical Centre	a.The sides of the lens are the centers of the imaginary spheres that come in parts.
2.Radius of curvature	b. The line passing through the center of light and the center of curvature.

3.Principal Axis	c.Is the midpoint of the lens.
4.Principal Focus	d. The optical center is the distance from the focal point.
5.Focal Length	e.The light rays falling on the lens, close to and parallel to the main axis of the concave lens, differ from each other after refraction. These rays appear to emanate from a point on the same axis as the falling rays.

Answer:
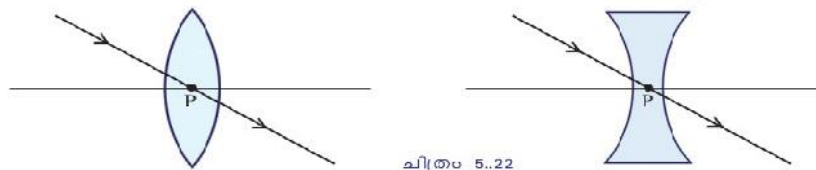
1. - c
2. - a
3. - b
4. - e
5. - d

9. **Lens imaging**

(1) Why is it that the main focus of the concave lens is illusory?

Answer: Light cannot be focused at a single point with a concave lens.

(2) What are the things to look out for when drawing ray diagram of reflection?

Answer:

(1) The path of the light passing through the optical center of the thin lens does not change.
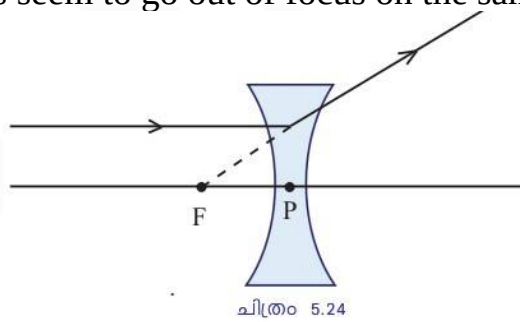

ചിത്രം 5..22

(2) The beam of light falling on the convex lens parallel to the principal axis passes through the focal point after refraction.

****

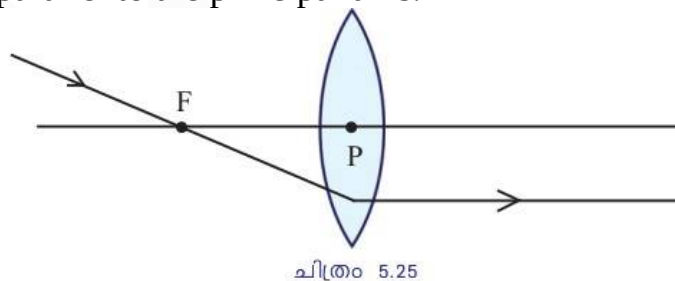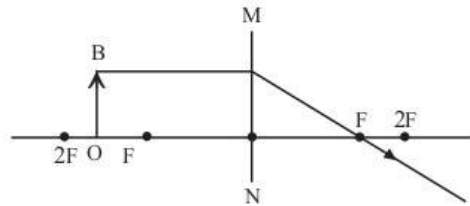**Aneesh Nilambur 9562091136**   **IGMMR School Nilambur**

ചിത്രം 5.23
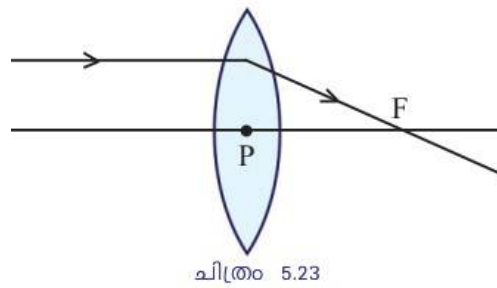
(3) The light rays falling on the lens parallel to the principal axis of the concave lens seem to go out of focus on the same side.

ചിത്രം 5.24

(4) The light beam passing through the convex lens through the focal length passes parallel to the principal axis.

ചിത്രം 5.25

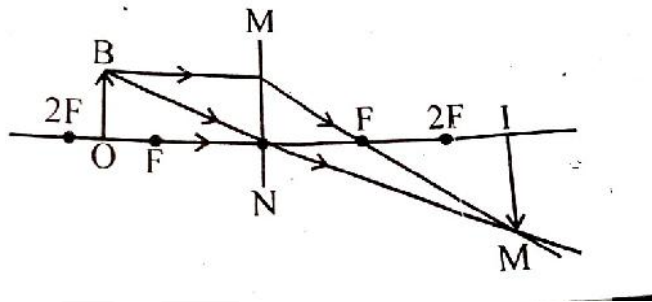(5)

41

(1) MN refers to a lens. So what kind of lens is that?

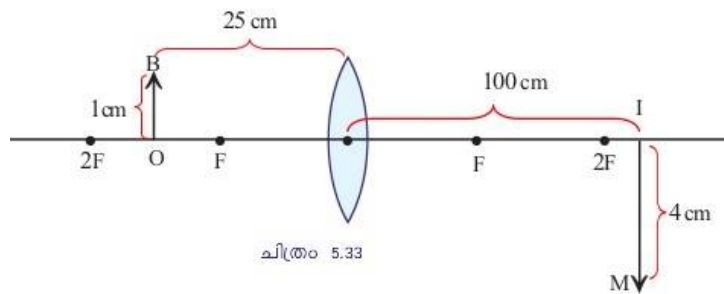(2) What are the characteristics of image?

(3) Complete the given figure?

Answer:

(1) Convex lens

(2) Larger, real, invert

(3)

10.   **Magnification**

(1) Calculate the magnification of the reflected image of the convex lens in Figure 5.33?

ചിത്രം 5.33

Answer:

$$m = \frac{v}{u} = \frac{4}{1} = 4$$

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Magnification is $m = \dfrac{h_i}{h_o} = \dfrac{-v}{u}$

$$= \dfrac{100}{25} = 4$$

(2) Write the magnification in mathematical form?

Answer:

$$\text{Magnification} = \dfrac{\text{Height of the image}}{\text{Height of the object}} = \dfrac{IM}{OB} = \dfrac{h_i}{h_o}$$

$$m = \dfrac{v}{u}$$

11.   **The power of the lens**

(1)

I. Calculate the power of a lens with a focal length of +25 cm?

II. You can guess what the + 2D mentioned in the doctor's note is about. What kind of lens is this? What is the focal length of this lens?

Answer:

I. $P = \dfrac{100}{25} = 4\,D$

II. Convex lens because its power is positive

$F = \dfrac{100}{P} = \dfrac{100}{2} = 50\,cm$

(2) What is meant by lens power? Which is the SI unit of Power? Calculate the power of a concave lens with a focal length of 25 cm?

Answer: The power of a lens is defined as the reciprocal of the focal length of the lens.SI unit diopter of power

In the given question the focus distance is given in centimeters so to see the power, $P = \dfrac{100}{-25} = -4\,D$

12.   **Atmospheric refraction**

(1) Do the stars really shine? Why?

Answer: The stars do not actually twinkle, it seems to be due to the refraction of the atmosphere.

(2) Do planets produce energy on their own like stars?

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Answer: No, we see the light coming from the sun after reflect the planets.

(3) Why do the stars seem to twinkle at night?

Answer: When light from a distant star passes through different layers of the atmosphere, each layer of the atmosphere has a different refractive index, which causes it to refract continuously. Because the stars are so far away, it feels like a point source. When the light rays from it reach the eye after refraction, it looks like it is coming from many other points. This is the reason for the star's glow.

(4) How does the atmosphere differ in its intensity of light when it is heated?

Answer: The light intensity decreases

06.Sight and world of colors

Content

1. **Eyes and vision**

    (1) What is the true meaning of Least Distance of Distinct Vision?

    Answer: The shortest distance for clear vision for healthy eyes is 25 cm, which is called the shortest distance for clear vision.

    (2) What do you call the farthest point where you can clearly see an object? How far is this distance seen?

    Answer: This distance, called the far point, can be calculated as infinite.

    (3) What is the name given to the lens' ability to adjust the distance of focus by varying the curvature of the lens so that the reflection falls on the retina, regardless of the position of the objects?

    Answer: Power of accommodation

    (4) The following are pictures of the reflection formed in the eye of a far-sighted person.
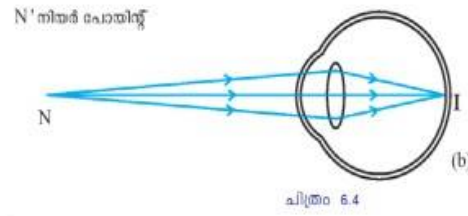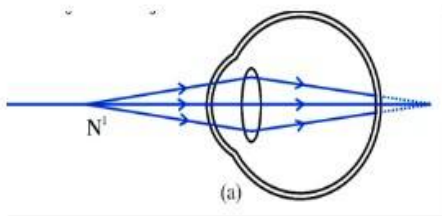
    (a) Does the reflection form on the retina when the object is at a near point? Can you see the reflection?

    (b) Does the reflection form on the retina when the object is far away? Can you see the clear reflection?

    (c) What is this disability called?

    Answer:

    (a) No, after the retina. The reflection cannot be seen.

    (b) Yes, there is a clear reflection.

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(c) Long sight

2. **Defects of the eye**

(1) A child in the back bench of the class can not clearly see the letters on the board. What's wrong with that kid's eye? How can this be fixed?

Answer: Short-sightedness. Unsuitable power can be fixed with a concave lens.

(2)

1. What is the cause of the short-sightedness of the eye?

2. Can the cause be found in relation to the size of the eyeball? Increase in size / decrease in size

3. What if the lens focuses on the distance (or power)? (Increase in power / decrease in power)

Answer: Decreasing the size of the eyeball and increasing the power

(3) When a person with visual acuity sees an ophthalmologist, it is recorded as +1.5D, -2D on the basis given for the purchase of spectacles.

a) What did the doctor refer to in the note?

b) What are the types of lenses written on the note?

Answer:

a) The power of the lens

b) +1.5 D convex lens, -2 D convex lens

(4) Haven't you seen the elderly people reading newspapers and other things at a distance? What is the reason for this?

Answer: Because the near point of their eye is greater. Decreasing the capacity of the ciliary muscles. That is, the ability to power off accommodation is low, which is called whitewashing.
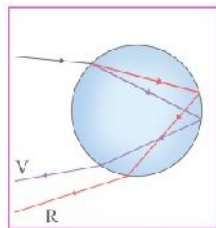
(5) How many hours after the death of the person who consented to the eye donation should the cornea be removed?

Answer: Within six hours

3. **Light phenomena**

(1) How does a rainbow form?

   Answer:

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Light comes out diffracted by two refractions and one internal reflection of sunlight passing through water droplets. Each color has a different wavelength, so it catches the observer's eye at different angles, which is why the rainbow looks like an arc.

(2) Under what circumstances can a rainbow be seen Circular shape?

Answer: If you look from the plane, you can see the rainbow in a circle.

(3)

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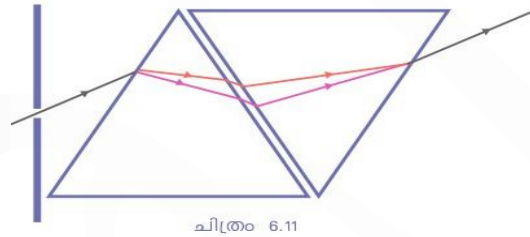
(1) Write down the activity shown above?

(2) What happened to the light as it passed through the first prism

(3) When passed through the second prism?

Answer:

(1) Transmit the white light through the prism and place the component colours on the screen. Place another similar prism on top of the first prism so that the foot rests on top.

(2) Light is divided into component colours (scattering)

(3) The whole component colours come together again and turn white.

(4) What is the name given to this phenomenon when a visual experience stays in our retina for 1/16 second?

Answer: Persistance of vision

(5) Scattering is a phenomenon of light, what is it?

Answer: Scattering is the irregular and partial deflection of light into particles in the medium.

(6) Which colour of white light has the most diffusion?

Answer: Violet

(7) Why was the vehicle's tail lamps and signal lamps painted red?

Answer: The red colour has a longer wavelength so the scattering will be less. The red colour can be used to travel long distances.

(8) Identify which phenomenon of light the given image is about.

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Answer: Tintal effect

(9) What are the consequences of light pollution?

Answer:

1. It adversely affects the natural way of life of living things
2. Observations are made impossible by obscuring the sky.
3. The light in the high flats distracts the migratory birds.
4. High beam light in vehicles can lead to an increase in road accidents.
5. Excessive use of lighting fixtures can lead to energy crisis

(10) What is the phenomenon that causes light scattering?

(a) Reflection

(b) Refraction

(c) Tintal effect

(d) Dispersion

Answer: Refraction

(11) The lunar X-ray-observatory telescope is located in space. What is the benefit of doing so? Find the answer by relating the scattering of light in the atmosphere.

Answer: The light coming from the heavens is not obscured by scattering.

(12) What is the main goal of the International Dark Sky Association?

Answer: Carrying out activities to reduce light pollution.

(13) What color is the sky visible to an astronaut?

Answer: Dark color

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07.Energy management

Content

Various energy forms

1. "When energy is transferred from one form to another, a small part is lost to other forms of energy" - is this statement correct?
    Answer: True, this loss is a major cause of the energy crisis.

2. What are fuels?
    Answer: Fuels emit a lot of heat during combustion.

3. What are the qualities that a good fuel should have?
    Answer:
    - Ignition rate should be moderate
    - Maximum availability
    - Cost reduction
    - Reduce air pollution
    - High caloric value
    - Security
    - Easy to store

4. What are the characteristics of fuels required for full combustion?
    Answer:
    - Solid fuels should be dry
    - Reach the temperature required for ignition
    - Provide oxygen for combustion
    - but can be seen as features of full combustion
    - Carbon monoxide does not form.
    - Increased thermal energy

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5. What are the disadvantages of partial inflammation?
   Answer:
   ➢ Fuel loss
   ➢ Loss of time
   ➢ Energy loss
   ➢ Air pollution
   ➢ Harmful to health

Fossil fuels

6. The sources of fossil fuels are listed.
   Answer:

Coal	Petroleum	Natural gas
● Coke	● Petrol	● LNG
● Coltar	● Kerosene	● CNG
● Colgas	● Diesel	
● Ammonia	● LPG	

LPG and safety

7. How to identify a leak in an LPG cylinder?
   Answer: LPG does not smell, but it does contain mercaptan oil. When there is a leak in the cylinder, this gaseous gas will come out first and then we can quickly detect the leakage of LPG.

8. If the duration of LPG is recorded on the cylinders, please indicate the information related to it.
   Answer:
   The period is recorded just below the top ring of the cylinder.
   A-22 refers to the month of A and 22 to the year 2022.
   January-March -A
   April-June -B
   July-September -C
   October-December -D

coal

9. How much coal is classified on the basis of the carbon content of the coal. What are they?
   Answer: Four,

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➢ Pete
➢ League Night
➢ Anthracite
➢ Bituminous call

10.   Why is coal called fossil fuel?

   Answer: Coal is the product of decaying plants over the years. Coal is also known as fossil fuel because of the metamorphosis of plant waste.

11.   Find and write more about CNG, LNG and LPG as fuels.

   Answer:

CNG	LNG	LPG
Cannot melt at normal pressure.	Can be liquefied at normal pressure	Can be liquefied at normal pressure
Difficult to transport to distant places	Easy to carry through pipes to faraway places	Easy to carry to distant places even in specially prepared cylinders
Methane is the main ingredient	Methane is the main ingredient	Propane and butane are important constituents

Biomass

12.   Which of the following is Green Energy?
   ● Coal
   ● Naphtha
   ● Biogas
   ● Petroleum gas

   Answer: Biomass

13.   Write examples of biomass and find out their shortcomings?

   Answer:

   Examples**:**   Firewood
                coconut shell
                Dung

   Disadvantages**:**   Calorie value is low Charcoal, smoke and ash are also present
                Atmospheric pollution. Loss of time

Caloric value

14.   What is the unit of calorific value?

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Answer: Kilojoule / kilogram

15. Some fuels and their calorific value are given below.
   Became the best fuel in terms of caloric value,Which can be calculated?
   Answer: Hydrogen

|	
Hydrogen	– 150000 kJ/kg
CNG	– 50000 kJ/kg
Dried cow dung	– 6000 – 8000 kJ/kg
LPG	– 55000 kJ/kg
Biogas	– 30000 – 40000 kJ/kg
Coal	– 25000 – 33000 kJ/kg
Petrol	– 45000 kJ/kg
Methane	– 50000 kJ/kg

Hydrogen

15.   Why not use hydrogen as a household fuel?
   Answer:
   ➢ Will catch fire easily
   ➢ Because of its explosive nature
   ➢ It is wise to store and move from one place to another.

16.   What is the name of the device below? Write the main parts of it?
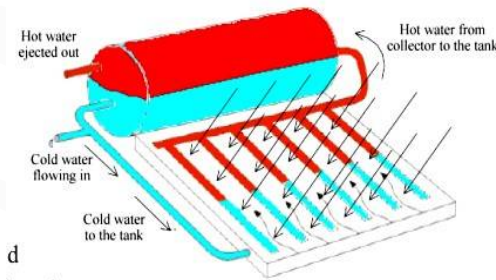
   Answer: This is a solar water heater
   Important parts:
   1. Water tank
   2. Collector pipes
   3. Soutand

Geothermal energy

17.   Write down the advantages and disadvantages of a geothermal power plant.
   Answer:
   Advantages
   ● No fuel required

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● No environmental pollution
● Low cost of production
Disadvantages
Can be installed in places with hotspots.

Energy from the nucleus

18.   Categorize the following statements as appropriate for nuclear fusion and nuclear fusion.

a) The process by which atomic nuclei are broken down into lighter nuclei using neutrons.

b) It is through this activity that energy is generated in the Sun and other stars.

c) Functionality of the atom bomb.

d) Also known as a chain reaction when uncontrolled.

e) Causing the action of the hydrogen bomb.

f) The nuclear reactor is used to harness the energy released by this operation.

g) very slow process

h) It is a spontaneous Process

i) It only happens at high temperatures.

j) Requires very high pressure and temperature.

k) It has not been possible to control this activity and produce energy on an industrial basis.

l) The fuel used is enriched uranium.

Answer:

<mark>Nuclear fission</mark>	<mark>Nuclear fusion</mark>
◆ The process by which atomic nuclei are broken down into lighter nuclei using neutrons. ◆ Functionality of the atom bomb. ◆ Also known as a chain reaction when uncontrolled. ◆ The nuclear reactor is used to harness the energy released by this operation. ◆ It is through this activity that	◆ It is through this activity that energy is generated in the Sun and other stars. ◆ Causing the action of the hydrogen bomb. ◆ Very slow moving Process ◆ It only happens at high temperatures. ◆ Requires very high pressure and temperature.

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Nuclear fission	Nuclear fusion
energy is generated in the Sun and other stars. ◆ The fuel used is enriched uranium.	◆ It has not been possible to control this activity and produce energy on an industrial basis.

Green Energy & Brown Energy

19.   Complete the list below with the energy forms you know?

Green Energy	Brown Energy

Answer:

Green Energy	Brown Energy
■ Solar cell ■ Tidal energy ■ Hydro Electric Power ■ Wind	■ Nuclear Energy ■ Diesel Energy ■ Thermal power

20.   The symbol below indicates what.

   Answer: Symbol of alertness to nuclear radiation

21.   The electric current is caused by the light electron current that forms on the P side when sunlight hits the N side of the PN-junction diode. What do you call this phenomenon?
   Answer: Photovoltaic effect.

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