Unit 1

EFFECTS OF ELECTRIC CURRENT

Electricity

$P=VI$

$P=I^2R$

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

Power

Incandescent lamp

Discharge lamp

Flourescent lamp

CFL

LED

Arc Lamp

Lighting effect | Heating effect

Joule's law

$R=R_1+R_2$

Resistors in series

Resistors in parallel

Heating appliances

Safety fuse

$H=I^2Rt$ — $H=P \times t$

Nichrome

$H=VIt$

$P = \dfrac{V^2}{R} t$

$\dfrac{1}{R} = \dfrac{1}{R_1}+\dfrac{1}{R_2}$

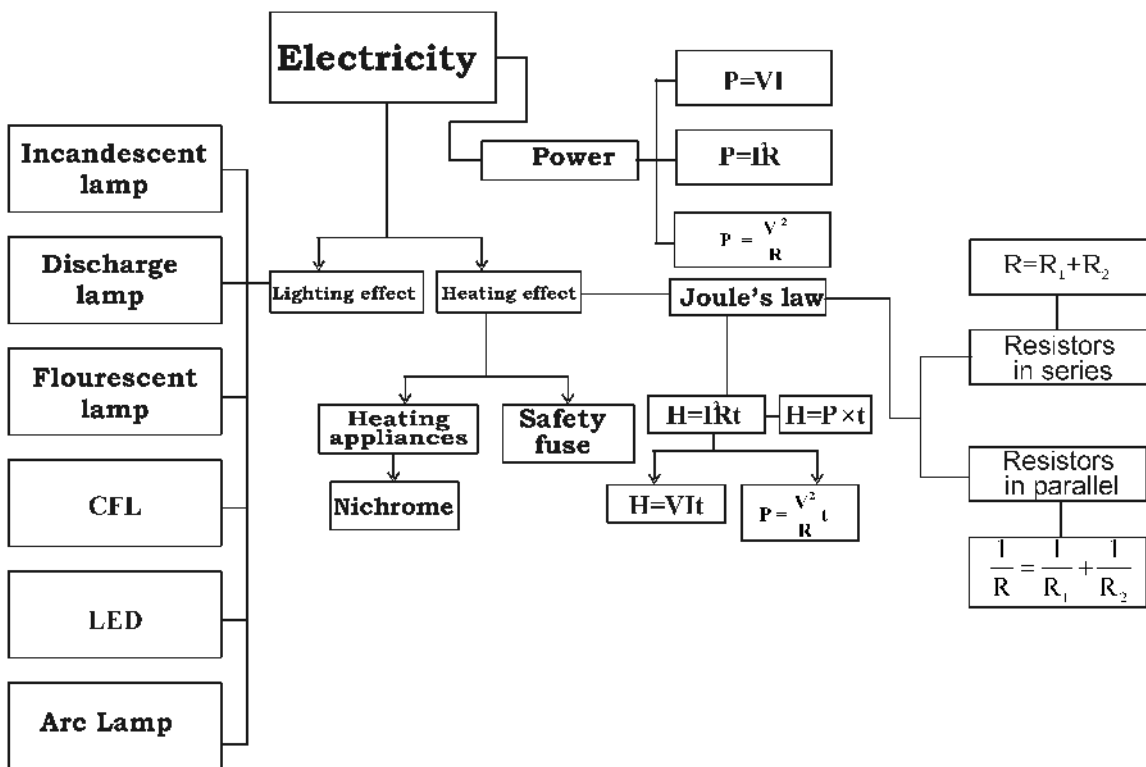**Points to remember**

⇨ Joule's law: The heat generated in a current carrying conductor is the product of the square of the current (I) in the conductor, the resistance of the conductor (R) and the time (t) of flow of current. If H is the heat generated, $H=I^2Rt$. The above equation can also be written as

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

$$H = VIt$$

⇨ When the current in the circuit is doubled, heat generated becomes four times.

⇨ If the current is halved, heat generated becomes $\dfrac{1}{4}$ times.

⇨ Instruments that make use of heating effects of electric current are electric heating appliances.

⇨ In electric heating appliances heat is produced in heating coil.

⇨ Heating coils are made up of nichrome.

⇨ Nichrome has high melting point and high resistivity.

⇨ Safety fuse is a device that works on the heating effect of electric current.

⇨ Fuse wire has low melting point.

⇨ During overloading and short circuit the fuse wire melts and circuit breaks.

⇨ In incandescent lamps filaments are made up of tungsten metal.

⇨ Tungsten metal has high resistivity and high melting point.

⇨ In order to avoid oxidation of tungsten, the bulb is evacuated, or filled some inert gas at low pressure or filled with nitrogen.

⇨ Colour of light emitted from a discharge lamp depends on the gas filled inside the lamp.

⇨ LED lamp gives more light but consumes less electrical energy.

⇨ Effective reistance is the sum of the resistance of all the resistors when they are connected in series. ie, $R = R_1 + R_2$.

⇨ Effective resistace is the sum of the reciprocal of all the resistors when they are connected in parallel. ie, $\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ or $R = \dfrac{R_1 R_2}{R_1 + R_2}$.

⇨ If resistors of the same value are connected in parallel, then $R = \dfrac{r}{n}$, Where n is the number of resistors and r is the resisance of one resistor.

⇨ The amount of energy consumed by an electrical appliance in unit time is power.
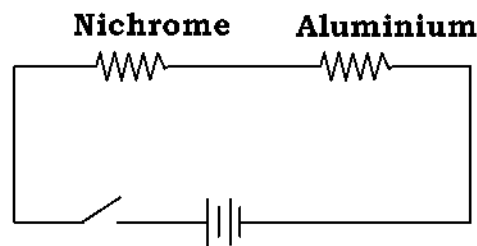
⇨ Units of power is watt(w)

⇨   Electric power (P) = I^2R

$P = \dfrac{V^2}{R}$, $P = VI$

ACTIVITY

1. Fill suitably
    Electric stove   : Heating effect
    Electric bulb   : ....

2.

Nichrome   Aluminium

Nichrome wire and aluminium wire of same length and thickness are connected in series to a battery.

a. Which is the wire that heated more when the circuit is switched on?

b. What are the factors affecting the heat produced in a current carrying conductor?

c. State the law which connect the factors affecting the heat produced in a current carrying conductor. Write the mathematical equation.

3. 1000 J heat energy is produced in a copper wire when the current is passed through it for one minute.

a. When current is doubled, what will be the heat energy produced.

b. When current is halved, what will be the heat energy produced

4. Instruments that make use of heating effect of electric current are electric heating appliances.

a. Write examples for electric heating appliances.

b. Which alloy is used to make heating coils in electric heating appliances ?

c. Why do we use this alloy as heating coil?

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

PHYSICS

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

b. Calculate the electrical energy consumed when heater works for one hour.

6. Observe the circuit.
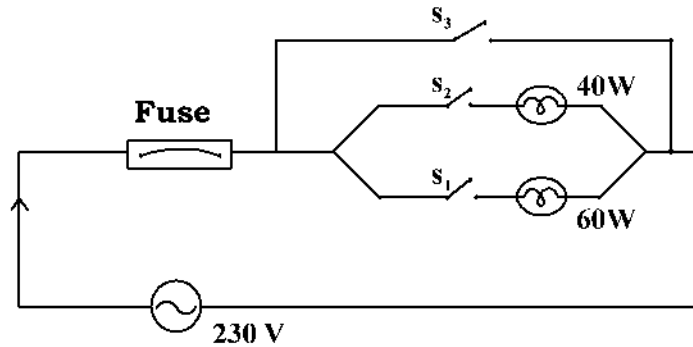
a. In which method bulbs are connected in this circuit.

b. If switches s_1, s_2, s_3 are switched on at the same time, what kind of change is observed in the circuit.

c. Write down the situations that cause high electric current through a circuit.

d. Calculate the total power of bulbs in the circuits.

7. Match the following

| a.	Incandescent lamp	Low power
b.	LED	Emit light as a result of discharge of electricity throught the gases filled in the glass tubes.
c.	Fluorescent lamp	Electrical energy lost in the form of heat

8. Observe the circuit

40W, 230 V
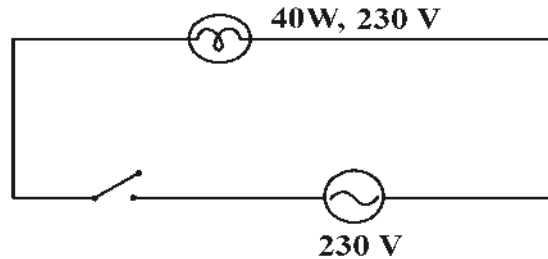
230 V

a. What is the power of bulb in the circuit? What is the resistance of the bulb ?

b. When a 60W bulb is connected in series to the 40W bulb, which bulb glows more brightly ? Justify your answer.

9. 100W bulb works on 230V supply.

a. If voltage is halved, how much will be the power ?

b. If voltage decreases to $\dfrac{1}{4}$ times how much will be the power ?

c. If the voltage is doubled what happen to the bulb ?

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

a. Ionised atoms collide with unionised atoms.

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

c. Ionised atoms move at high speed and collide with unionised atoms among them and excite them to higher energy states.

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

Fill suitably

11. Tungsten.   :   Filament lamp

    ....   :   Iron box

12. Observe the figure
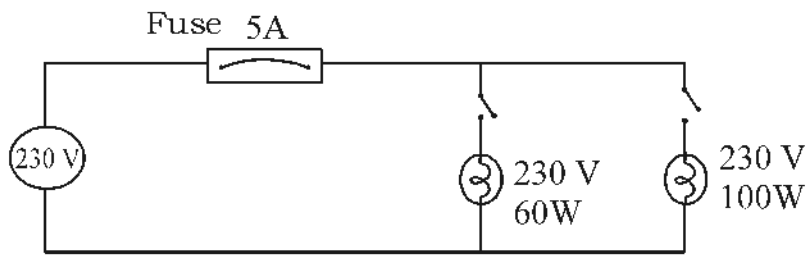
a. What will be the maximum power of the appliances to be connected in this circuit?

b. What will be the change in power of the bulbs, if voltage is reduced to 110 V?

13. Keeping the resistance constant if the voltage is halved, the power becomes.

a. Decreases to $\frac{1}{4}$ times.

b. Decreases to $\frac{1}{16}$ times.

c. Doubled.

14. Observe the circuit given below.
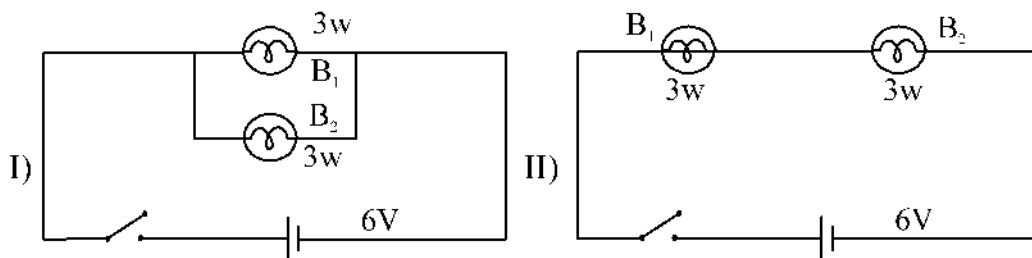
a. Bulbs of which circuit glows more brightly. Why?

b. What do you observe when one of the bulbs is removed from each circuit.

15. Three resistors $8\,\Omega$, $6\,\Omega$, $4\,\Omega$ are connected in parallel. Choose the effective resistances from the following $(8\,\Omega, 6\,\Omega, 4\,\Omega)$

$(0.5 \Omega, 0.75 \Omega, \quad 1 \Omega, 2 \Omega)$

16. LED bulbs are nowadays used to save electrical energy.

    a. What are the advantages of LED bulbs.

    b. List the parts of LED bulbs.

17. Parts of LED bulbs are given in the table below. Write the function of each part and complete the table

Part of LED bulb	Function
Heat Sink	
Power supply board	
Printed circuit board	
Base unit	

18. All of you constructed LED bulbs in your class rooms.

    a. Write the instances in which LED bulbs get damaged.

    b. List out the tools to rectify the defects of LED lamps.

19. You are given five 10Ω resistors.

    a) What is the minimum and maximum resistors obtained by combaining these resistors

    b) Draw the circuit diagram.

20. Filament lamps produce light by glowing with heat.

    a.   Which metal is used to make filaments in inlandescent lamps.

    b.   Why incandescent lamps are filled with nitrogen.

21. Which of the following equation does not represent heat produced in a current carrying conductor.

    a. $H = v^2 Rt$ b. $H = v^2 Rt/R$ c. $H = I^2 Rt$ d. $H = VIt$

22. Fuse wire is to be used by understanding the ampearage correctly.

    a.   What is ampearage?

    b.   A1840W water heater works in 230V supply. Calculate the amperage of the fuse wire for the heater.

23. The important part of safety fuse that works according to the heating effect of current is fuse wire.

a. Which alloy is used to make fuse wire.

b. In which mode is the fuse wire connected in the circuit.

c. What are the situations in which excess current flows in a circuit so us to melt the fuse wire?

24. The voltage and current in a circuit can be varied by connecting resistors in different ways.

a. What are the ways in which resistors can be connected in a circuit?

b. What is the maximum and minimum resistance obtained by connecting two resistors 6Ω and 12Ω.

25.
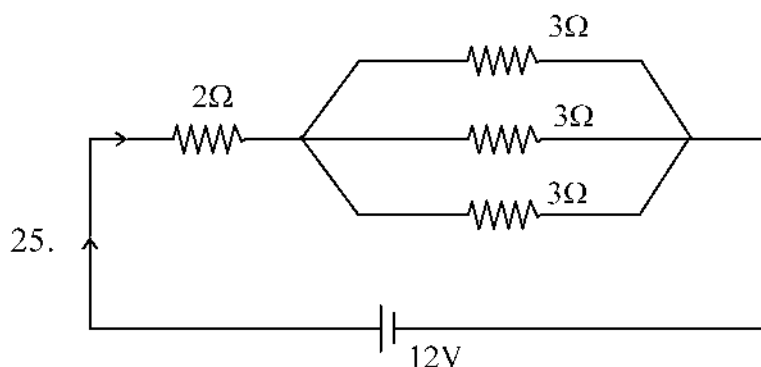
a. What is the effective resistance of the circuit?

b. Calculate the current flowing through the circuit.

c. Low energy consumption.

d. Long life

e. Less environmental pollution.

Answer Key

1. lighting effect
2. a. Nichrome wire, Resistance is more

   b. Intensity of electric current, Resistance,

      Time of flow of current

   c. $H = I^2Rt$, Joule's law

3. a. 4000 J

   b. 250 J

4. a. Iron box, Electric heater

   b. Nichrome

   c. High resistivity

   High melting point

5. a. Electrical energy $\longrightarrow$ Heat energy

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

   $= \dfrac{230 \times 230 \times 60 \times 60}{1000}$

   $= 190440$ J

6. a. Parallel

   b. Fuse wire melt

   c. Short circuit

   over loading

   d. 60W + 40W = 100W

   Amperage $= \dfrac{\text{wattage}}{\text{voltage}}$

   $= \dfrac{100}{230}$

   $= 0.43$A $\quad \therefore$ 1A

7.

a.	Incandescent lamp	Electrical energy lost in the form of heat
b.	LED	Less power
c.	Fluorescent lamp	Emit light as a result of discharge of electricity throught the gases filled in the glass tubes.

8. a. 40 W

$$R = \frac{V^2}{P} = 230 \times 230/40$$

$$= 1322.5\,\Omega$$

   b. 40 W bulb, Resistance is more

9. a. 25 W

   b. 6.25W

   c. device will be damaged due to high voltage.

10. 1. d

    2. a

    3. c

    4. b

11. Nichrome

12. a. P   =   VI

                 =   230 × 5

                 =   1150 W

    b. 25W, 15W

Unit Test

Class : 10

Time :40 Minutes
Score : 20

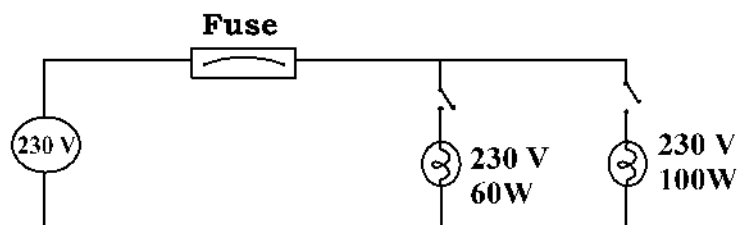
Answer both questions, each carries one score.

1. If the intensity of electric current is halved, the heat produced in the conductor becomes.

   a. halved

   b. doubled

   c. decreases to 1/4 times.

   d. becomes 4 times. (1)

2. An induction cooker is marked 2000W, 230V. What does it indicate?
   (1)

**Answer any two from questions 3 to 5. Each carries 2 scores.**

3.

   a. Calculate the wattage of bulbs in the circuit. (1)

   b. What is the amperage of fuse wire in the circuit ? (1)

4. Calculate the heat energy produced in a conductor of resistance 100Ω carries a current of 1A for 1 minute.

5. Prepare a poster on 'Energy Conserving Lamps' for giving awareness to people.

Answer any two from questions 6 to 8. Each carries 3 scores.

6. Safety fuse ensure safety in electrical circuits.

   a. What are the peculiarities of fuse wire? (1)

   b. What are the precautions to be taken when fuse wire is

connected in electrical circuits? (2)

7.

100W, 230V
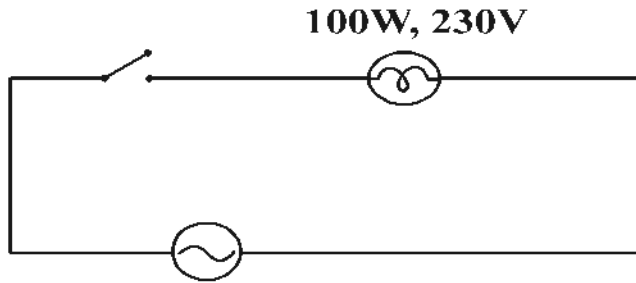
a. What is the resistance of bulb in the circuit ? (1)

b. When a 40W bulb is connected in series to a 100W bulb. Which bulb glows more brightly ? Justify your answer. (2)

8. Classify the following statements suitably on the basis of incandescent lamp, discharge lamp and LED bulb.

a. Inert gases are filled at low pressure

b. Ionised atoms collide with unionised atoms.

c. As there is no filament, there is no loss of energy in the form of heat.

Answer both questions

9. Observe the circuit.
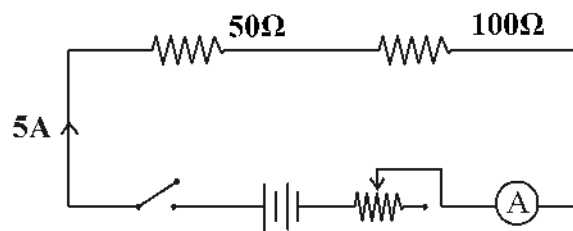
Current flowing through the circuit for 5 minutes.

a. In which method resistances are connected in the circuit. (1)

b. Which resistor heated more when the circuit is switched on ? (1)

c. Calculate the heat generated in both the resistors. (2)

10. Broken filament of a bulb is rejoined and lightened.

a. What happened to the resistance of the filament ? (1)

b. What is the change in the strength of current through the filament? (1)

c. What is the change in the power of the bulb? Justify your answer. (2)

Answer Key

1. C

2. If it works in 230 V supply, power obtained is 2000W.

3. a. 60W + 40W = 160W

   b. Amperage $= \dfrac{\text{wattage}}{\text{voltage}}$

   $= \dfrac{160}{230}$

   $= 0.69\ A \quad \therefore\ 1A$

4. $H = I^2Rt$

   $H = 1^2 \times 100 \times 1 \times 60 \ = 6000\ J$

5. Use LED lamp and save electrical energy save energy for the future.

6. a. Made up of alloy

   low melting point.

   b. The ends of the fuse wire must be connected firmly at appropriate points.

   The fuse wire should not project out of the carrier base

7. a. $H = \dfrac{V^2}{p}$

   $H = \dfrac{230 \times 230}{100} = 529\ \Omega$

   b. bulb of 40 W

   Current through both bulbs are same, so bulbs having more resistance glows brightly.

8.

Incandescent lamp	discharge lamp	LED Bulb
a	b	c

9. a. Series connection

b. $100\,\Omega$, Current is same, so resistor having more resistance heated more.

c. $\dfrac{50\,\Omega \ \text{Resistance}}{H=I^2Rt}$

$= 5 \times 5 \times 50 \times 5 \times 60 \ = 375000 \ J$
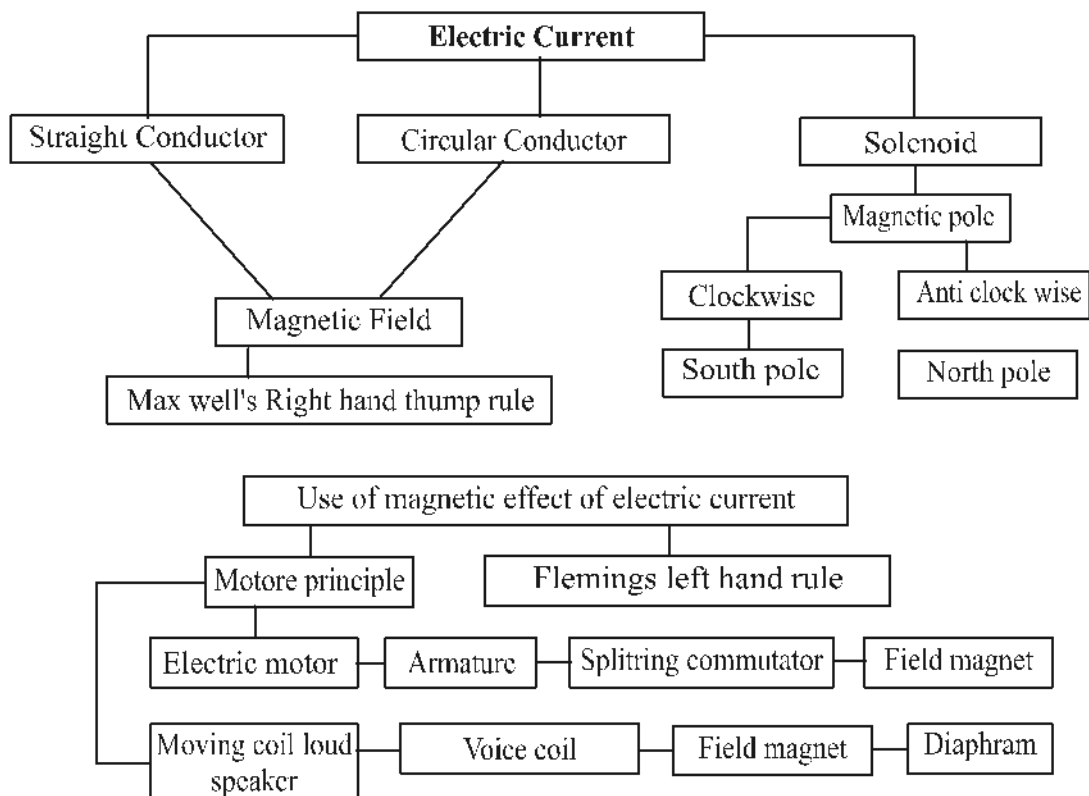
$\dfrac{100\,\Omega \ \text{Resistance}}{H=I^2Rt}$

$= 5 \times 5 \times 100 \times 5 \times 60 \ = 750000 \ J$

10. a. Decreases

b. Increases

c. Increases

$P = VI$ so, if current increases power also increases.

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Unit 2

MAGNETIC EFFFECT OF ELECTRIC CURRENT

Electric Current
- Straight Conductor
- Circular Conductor
- Solenoid

Straight Conductor / Circular Conductor → Magnetic Field → Max well's Right hand thump rule

Solenoid → Magnetic pole
- Clockwise → South pole
- Anti clock wise → North pole

Use of magnetic effect of electric current
- Motore principle
- Flemings left hand rule

Motore principle → Electric motor → Armature → Splitring commutator → Field magnet

Moving coil loud speaker → Voice coil → Field magnet → Diaphram

Points to remember

1. Magnetic effect of electric current:
    - ◆ A magnetic field is produced around a current carrying conductor.
    - ◆ The direction of magnetic field depends on the direction of current.
    - ◆ The direction of magnetic field around a current carrying conductor can be found by James Clerk Maxwell's Right Hand Thumb rule

2. Right hand thumb rule by James Clerk Maxwell:

◆ If a current carrying conductor is held in the right hand with the thumb towards the current then other fingers encircle in the direction of magnetic field.

3. Magnetic field around a circular coil carrying current:
   ◆ If the current is in clockwise direction, magnetic field is directed into the coil.
   ◆ If the current is in anticlockwise direction, magnetic field is directed out of the coil

4. The factors affecting the magnetic effect of electricity:
   ◆ Strength of current
   ◆ Number of turns of the coil

5. Solenoid:
   ◆ A solenoid is an insulated wire wound in the shape of a helix.
   ◆ A current carrying solenoid act as a magnet

6. Determination of polarity of a current carrying solenoid:
   ◆ The end of the solenoid at which current flows in the clockwise direction will be the South Pole and the end at which current flows in the anti clockwise direction will be the North Pole.
   ◆ The end of the current carrying solenoid which repel the North pole of the magnet is the North Pole and the end of the solenoid which repel the South Pole of the magnet is the South Pole.

7. Differences between the magnetic fields of Solenoid and bar magnet:
   ◆ **Bar magnet:**
   ◆ Magnetism is permanent.
   ◆ Polarity cannot be reversed
   ◆ Magnetic strength cannot be changed as desired
   ◆ **Solenoid:**
   ◆ Magnetism is temporary.
   ◆ Polarity can be reversed by reversing the current
   ◆ Magnetic strength can be increased or decreased as desired.

8. Motor Principle:
   ◆ A current carrying conductor in a magnetic field experiences a force
   ◆ Devices that work on the basis of motor principle:
   (i) Electric motor   (ii) Moving coil loudspeaker

9. Experiment to prove motor principle:
   ◆ A copper rod is suspended perpendicularly between the poles of a U magnet.
   ◆ When a current is passed, the copper rod moves in one direction.
   ◆ When the current is reversed, the copper rod moves in the opposite direction

- ◆ The copper rod will move in the opposite direction if the magnetic field is reversed.
- ◆ The direction of motion of the conductor can be found by Fleming's Left Hand Rule

10. Fleming's Left Hand Rule:
   - ◆ Hold the forefinger, middle finger and thumb of the Left Hand in mutually perpendicular directions with forefinger towards the direction of magnetic field, middle finger towards the direction of current then thumb will indicate the direction of motion of the conductor.

11. Important parts of electric motor:
   - ◆ Field magnet
   - ◆ Armature coil
   - ◆ Graphite brushes
   - ◆ Split ring commutator
   - ◆ Split ring commutator helps to change the direction of current.

12. Energy conversion in motor and loudspeaker:
   - ◆ Electric motor: Electrical energy to Mechanical energy
   - ◆ Moving coil loudspeaker: Electrical energy to Sound energy

13. Important parts of Moving coil loudspeaker:
   - ◆ Field magnet
   - ◆ Voice coil
   - ◆ Diaphragm.

14. Working of moving coil loudspeaker:
   - ◆ The electrical pulses from the microphone are strengthened and passed through the voice coil.
   - ◆ Thus the voice coil placed in the magnetic field moves to and fro rapidly according the electric pulses.
   - ◆ Thus the diaphragm vibrates and reproduces sound.

ACTIVITY

1. A straight conductor AB is arranged parallel to a magnetic needle as shown in figure. When the switch is on, the magnetic needle deflects.
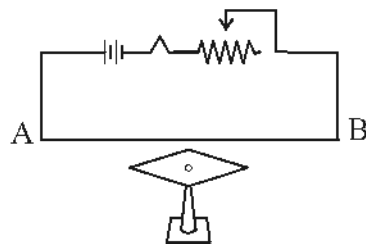
a) The direction in which the North pole of the magnet deflects is: (Clockwise / Anticlockwise)
   Name the law used to find the direction of deflection of the needle?

b) What is the reason for the deflection of the needle?

c) Suggest a method to reverse the direction of deflection of the magnetic needle?

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

Rheostat
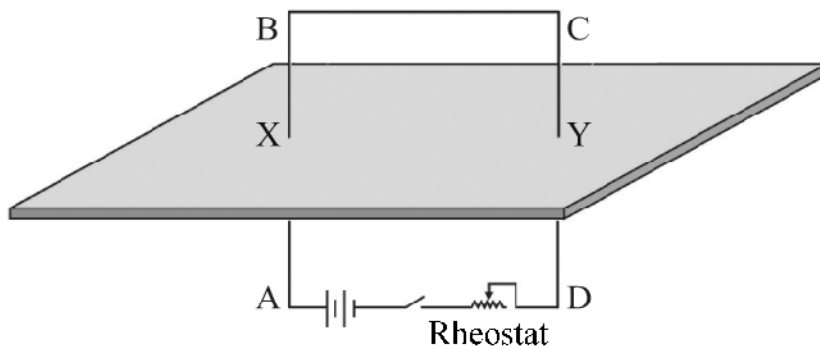
a) Mark the direction of magnetic field around the points X and Y.

b) Name and state the law used to find the direction of magnetic field.

3. Which of the following figure related to the polarity of a current carrying coil is correct?


| (a) | (b) | (c) |
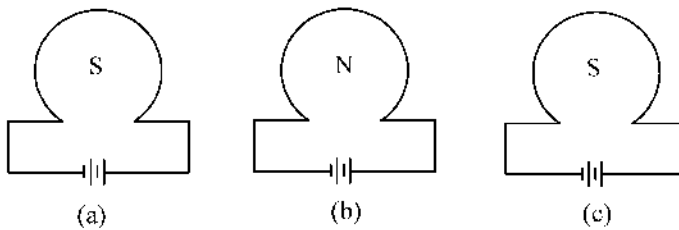
4. A circular coil is inserted into a cardboard as in figure. The portions passing through the cardboard are marked as P and Q.


(a)
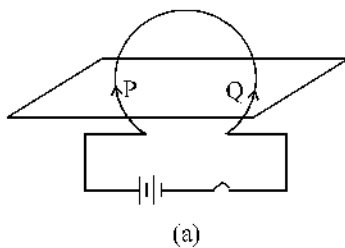
a) Draw one magnetic field line each around P and Q.
b) Draw a magnetic field line through the center of the coil
c) Write down two factors that affect the magnetic field strength at the center of the circular coil?

5. A circular loop and a solenoid are shown in figure.
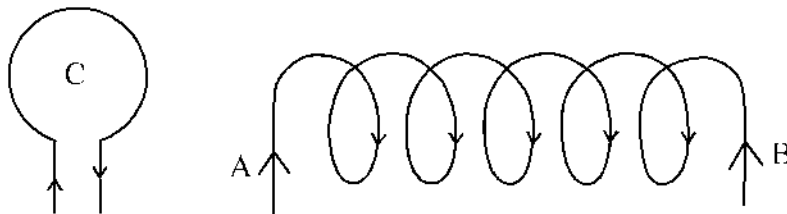
a) Identify the polarity of
(i) The face of the loop you are looking at. (ii) The end B of the solenoid.
b) What is the direction of magnetic field at the center of the loop?

6. A magnetic needle is arranged at the end Q of a solenoid PQ.
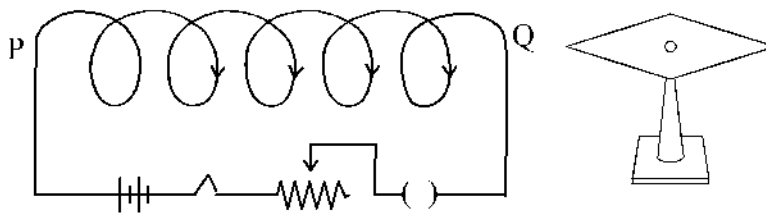
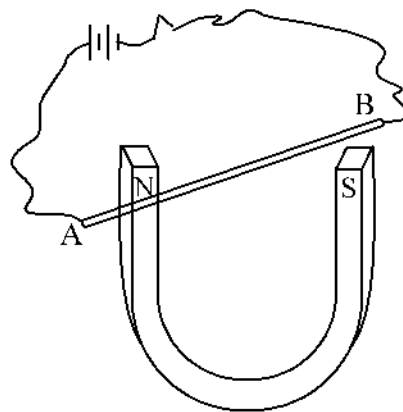a) When the switch is ON, which pole of the magnetic needle is attracted towards the end Q?
b) State the fact that helped you to reach the above conclusion?
c) Suggest two methods to increase the magnetic field strength of a current carrying solenoid.

7. The magnetic field lines around a solenoid are shown in figure.
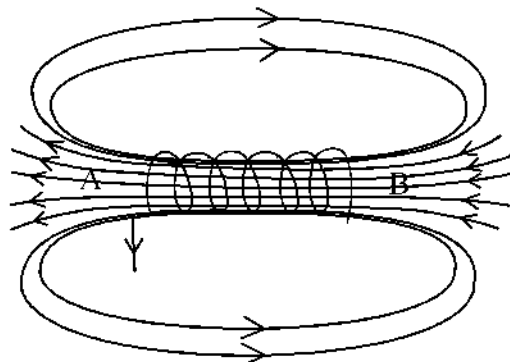
a) Identify the direction of flow of current at the end A of the solenoid?

b) What are the differences between the magnetic field due to a solenoid and that due to a bar magnet?

8. Electric motors work according to motor principle.
   a) Write down the energy conversion taking place in an electric motor.
   b) Which law will you use to find the direction of rotation of the armature of the electric motor? State the law.
   c) Name another device that works according to motor principle

9. Figure shows a straight conductor arranged perpendicular to a strong U magnet.

a) In which direction will the conductor move when the switch is ON.
b) Name the law used to find the direction of motion of the conductor?

10. ABCD is a rectangular coil arranged so as to move freely in a magnetic field.
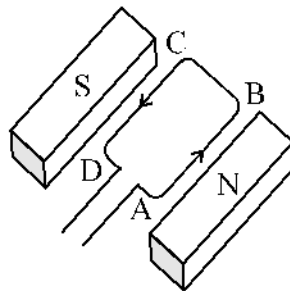
a) In which direction will the coil rotate when a current is passed through the coil in the direction ABCD?
b) Why commutator is necessary for the continuous rotation of the coil?

11. Figure shows a Moving coil loudspeaker.
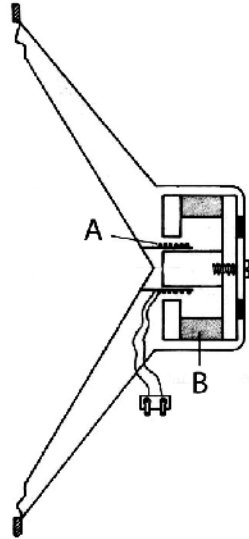
a)   Name the parts marked A and B?
b)   What is the energy conversion in this device?
c)   What is the working principle of a moving coil loudspeaker?
d)   Explain the working of this device.
Force, Current, Resistance, Magnetic field.

12.   Figure shows Fleming's Left Hand Rule. Pick the ones suitable for a b and c from the following table.
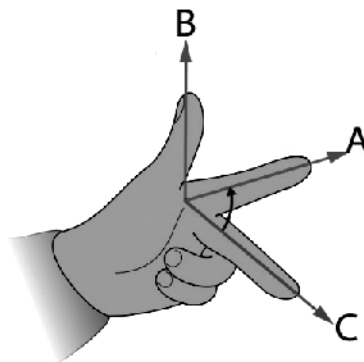
13.   The magnetic field lines inside a current carrying solenoid are
       a) Along the axis and parallel to each other

b) Perpendicular to the axis and equidistant from each other.

c) Circular and do not intersect each other

d) Circular and intersect each other

14. Figure shows a bar magnet arranged near a solenoid. When the switch is put on, will the solenoid attract or repel the bar magnet? What is the reason?
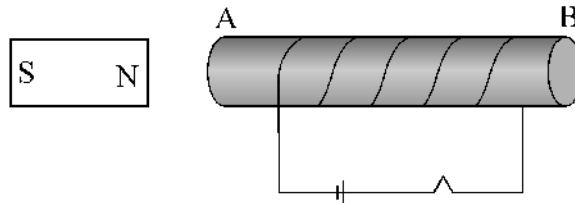
15. The direction of current through a straight conductor is shown figure.
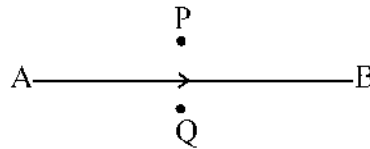
What is the direction of the magnetic field at the points P and Q.

ANSWER KEY

1. (a) Anticlockwise direction.

Maxwell's Right hand thumb rule

(b) When a current is passed through the conductor, a magnetic field is produced
around it.

(c) Reverse the direction of current.

2. (a)

(b) Maxwell's Right hand thumb rule

3. (c)

4. (a)

(b)

(c) Number of turns of the coil, current.

5.   (a) (i) South Pole   (ii) North Pole

    (b) Into the coil

6.   (a) South Pole

    (b) In the end Q, the current is in anti clockwise direction and hence it is the North pole. Hence this end attracts the South pole of the magnetic needle

7.   (a) Anticlockwise direction

    (b)

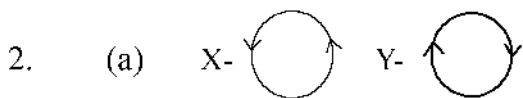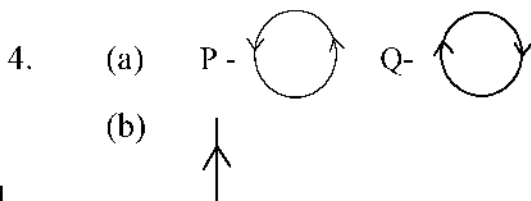| Solenoid	Bar magnet
Magnetic field is temporary	Magnetic field is permanent
Polarity can be reversed	Polarity cannot be reversed
Magnetic field strength can be increased or decreased as desired	Magnetic field strength cannot be increased or decreased as desired

8.   (a) Electrical energy ö'Mechanical energy

    (b) Fleming's left Hand Rule

    (c) Moving coil loudspeaker

9.   (a) Downwards

    (b) Fleming's Left Hand Rule

10.   (a) Anticlockwise direction.

    (b) If the rotation of the armature is to be sustained, the direction of current through the armature should change continuously. The split rings help to change the direction of current through the coil after every half rotation.

11.   (a) A – Diaphragm   B – Field Magnet

    (b) Electrical energy ö'Sound energy

    (c) Motor principle

    (d) The electrical pulses from a microphone are strengthened and send through the voice coil of a loudspeaker. The voice coil which is placed in the magnetic field move to and fro rapidly in accordance with the electrical pulses. These movements make the diaphragm vibrate and reproduce the sound.

12.   a – magnetic field

    b – Force

    c – Current

13.   (a)

14.   Attracts.

    Since the current is in clockwise direction, the end A is South Pole.

15.   P – Out of the plane of the paper

    Q – Into the plane of the paper.

Unit Test

Class : 10

Time :40 Minutes

Score : 20

SECTION A. 1 mark each

1. Electricity flows through a very long solenoid. Some statements are given below related to the magnitude of the magnetic field developed. Find out the correct statement:
   a) It is zero
   b) It will be the same at all points
   c) It gradually decreases towards the end
   d) It gradually increases towards the end

2. Figure shows a circular coil carrying current. Draw the magnetic field line through the center of the coil.
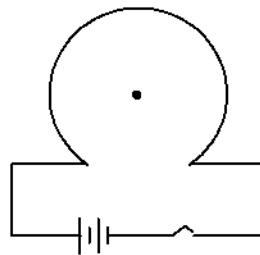
SECTION B – 2 MARKS EACH

3. An electrical device is shown in figure.
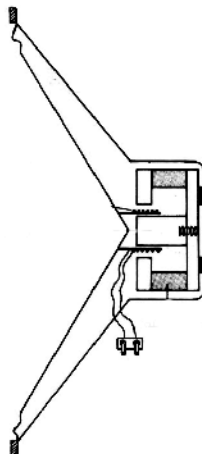
(a) Identify the device?

(b) What is the working principle of this device

4. Figure shows a magnetic needle arranged near a solenoid.
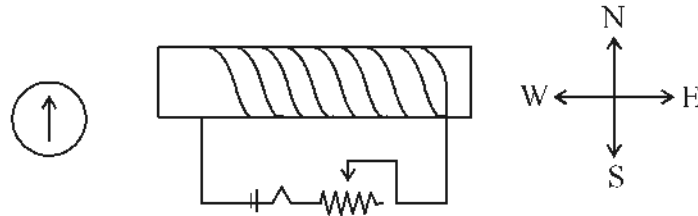
(a) In which direction will the North Pole of the magnetic needle deflect when the switch is ON?

b) Why the magnetic needle deflects in this way?

SECTION C. 3 MARKS EACH

5. A straight conductor AB is arranged parallel to a magnetic needle as shown in figure.
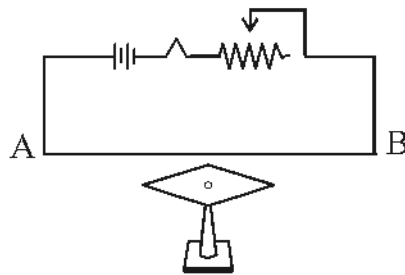
a) When the switch is ON, the magnetic needle deflects. What is the reason?

b) Name the law used to find the direction in which the magnetic needle deflects?

c) Suggest a method to make the deflection of the needle in opposite direction.

6. The figure shows an experimental arrangement to study the intensity of magnetic field around a current carrying coil.
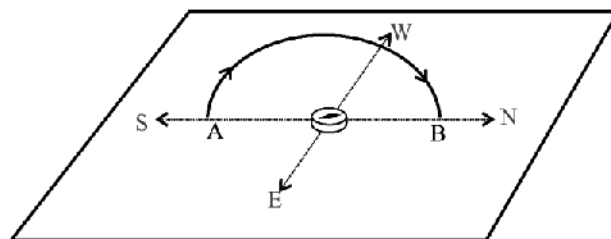
a) What is the direction of the magnetic field produced by the circular coil shown in figure

b) Suggest two methods to increase the magnetic field strength of a circular coil.

c) Why is the coil kept in the North South direction?

SECTION D. ANSWER ANY TWO QUESTIONS. 4 MARKS EACH

7. A magnetic needle is arranged at the end P of a solenoid PQ.
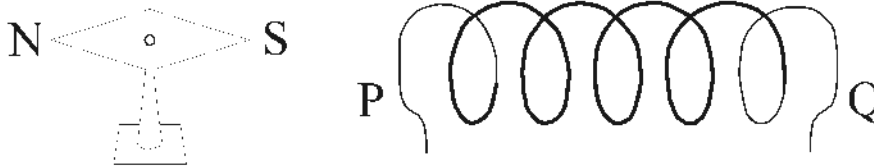
a) When the switch is ON, the South Pole of the magnetic needle move towards the end P. Then what is the direction of current at the end P of the solenoid

b) Write down the fact that helped you to find this direction?

c) Suggest two methods to increase the magnetic field strength of a solenoid.

8. A Straight conductor AB is arranged so as to move freely in the magnetic field of a U magnet as in figure.
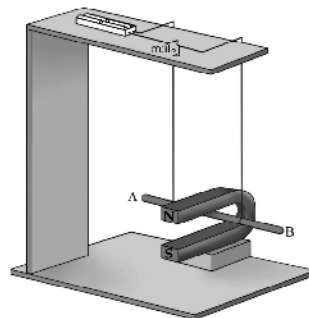
a) In which direction will the conductor AB move when the switch is ON.

b) Name and state the law used to find the direction of motion of the conductor.

c) Suggest a method to keep the direction of motion of the conductor constant, even when the current is reversed

9. A rectangular coil ABCD is arranged so as to move freely in a magnetic field.
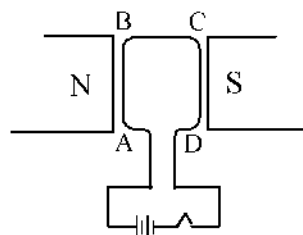
a) What are the directions of the forces acting on the arms AB and CD of the coil?

b) What is the effect of these forces on the coil

c) If the direction of current is reversed, what happens to the direction of motion of the coil in the magnetic field?

d) Give examples of two devices making use of this principle.

ANSWER KEY

1. (C)

2. ↑
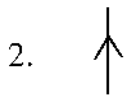
3. (a) Moving coil loudspeaker

   (b) Motor principle

4. (a) Towards W (West)

   (b) Near the needle, the current in the solenoid is in the anticlockwise direction and North pole is formed. Thus the North pole of the magnetic needle is repelled towards W

5. (a) Since a magnetic field is produced around the conductor

   (b) Maxwell's Right Hand Thumb Rule

   (c) Reverse the direction of current

6. (a) Into the coil.

   (b) Increase the number of turns and increase the current

   (c) To avoid the influence of magnetic field of the earth in the result.

7. (a) Anticlockwise direction.

   (b) If the current in the solenoid is seen in the anticlockwise direction, that end is the North Pole

   (c) Increase the number of turns and increase the current.

8. (a) Backwards

   (b) Fleming's left hand rule

   (c) Reverse the direction of the magnetic field.

9. (a) AB – downwards   CD –Upwards

   (b) Coil starts rotating in the clockwise direction

   (c) Coil starts rotating in the opposite direction

   (d) Electric motor, moving coil loudspeaker.

Unit 3

ELECTRO MAGNETIC INDUCTION

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                        ┌─────────────────────────┐
                        │ Electromagnetic Induction│
                        └─────────────────────────┘
        ┌─────────────────────────┼──────────────────────┐
┌──────────────────────────────┐ ┌──────────────┐ ┌──────────────┐
│Definition of electromagnetic  │ │Mutual Induction│ │Self Induction│
│Induction                      │ └──────────────┘ └──────────────┘
└──────────────────────────────┘         │                │
        ┌──────────────────────┐   ┌──────────────┐  ┌──────────┐
        │Fleming's Right hand rule│ │ Transformer  │  │ Inductor │
        └──────────────────────┘   └──────────────┘  └──────────┘
   ┌──────────────┐ ┌──────────────────────┐  ┌─────────────────────────┐
   │ AC Generator │ │Moving coil microphone│  │Step down transformer    │
   └──────────────┘ └──────────────────────┘  └─────────────────────────┘
        │
   ┌──────────────┐         ┌────────────────────┐
   │ Single phase │         │Step up transformer │
   │ generator    │         └────────────────────┘
   └──────────────┘                  │
                            ┌────────────────────┐
                            │ Power distribution │
                            └────────────────────┘
                                     │
                            ┌────────────────────┐
                            │ House hold wiring  │
                            └────────────────────┘
                                     │
                            ┌────────────────────┐
                            │  Three pin plug    │
                            └────────────────────┘
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◆
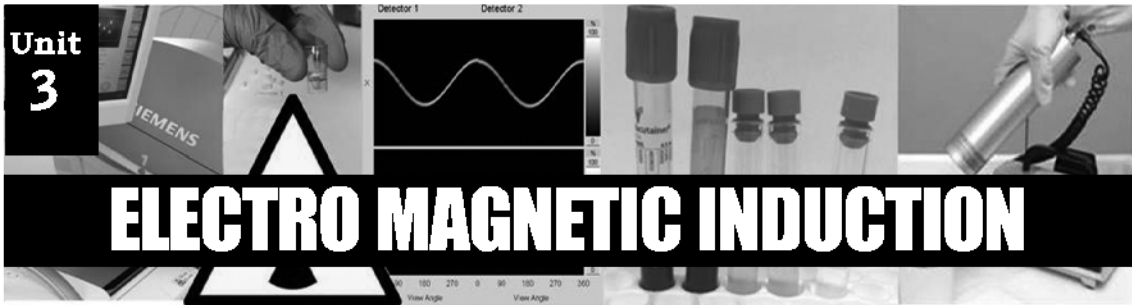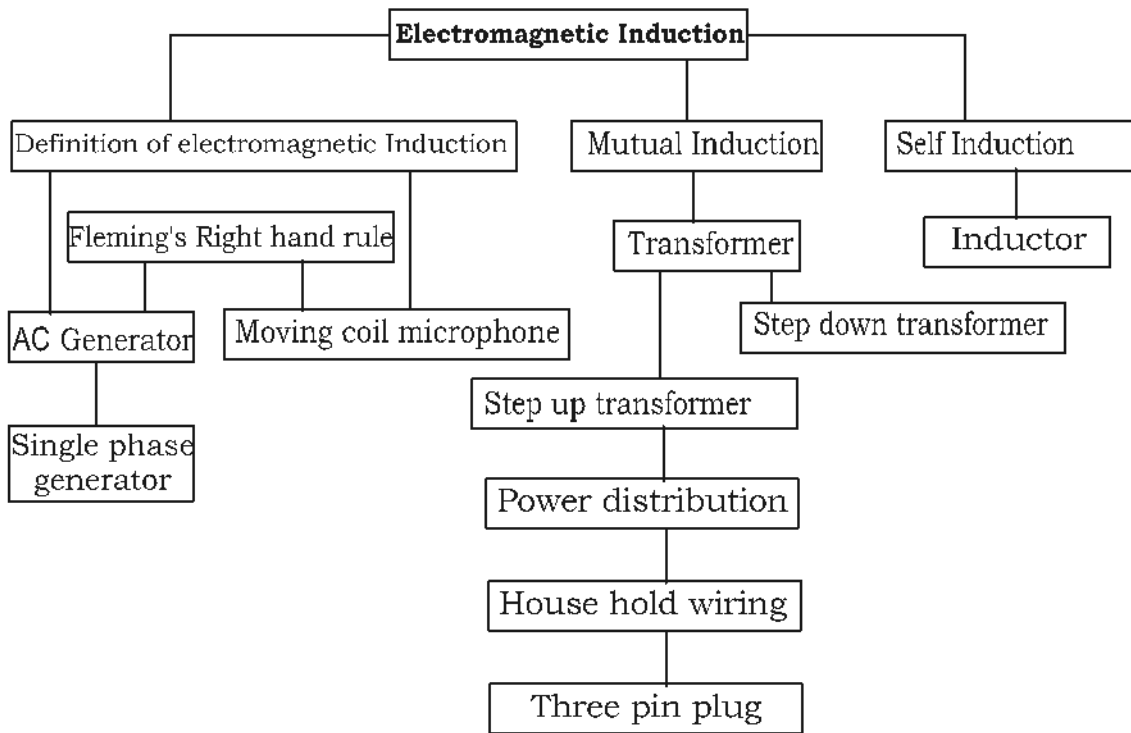
Points to Remember

❖ In AC generator the rotating part is armature.

$$\frac{Vs}{Vp} = \frac{Ns}{Np}, \quad \frac{Vs}{Vp} = \frac{Ip}{Is}$$

Electromagnetic induction

Whenever there is change in the magnetic flux linked with a coil, an emf is induced in the coil. This phenomenon is electro- magnetic induction.

Fleming's right hand rule

Imagine a conductor moving perpendiculor to a magnetic field. Stretch the fore fingure, middle finger and thump of the right hand mutually perpendicular directions. If the fore finger represents the direction of the magnetic field and thump respresents the direction of motion of the conductor, then, the middle finger represents the direction of the induced current.

AC Current

Current that changes direction at regular intervals of time, is an alternating current(AC)

DC Current

A current that flows only in one direction contiously is a direct current.

Mutual induction

Consider two coils of wire kept side by side. When the strength or direction of the current in one coil changes, the magnetic flux around it changes. As a result, an emf is induced in the secondary coil. This phenonenon is the mutual induction.

Self induction

The change in magnetic flux due to the flow of an AC in a solenoid will generate a back emf in the same solenoid in a direction opposite to that applied to it. This phenoenon is known as the self induction.

Inductor

Inductor are coils used to oppose the changes in electric current in a ciruit. They are used to control current in a circuit to the desired value without loss of power

ACTIVITY

1. Observe the figure.

Permanent magnet   Solenoid   Galvanometer

(i) Draw the complete circuit of the experiment done in class room, to produce electric current using the components shown.

(ii) Which phenomenon causes the production of electricity through the circuit.

(iii) Define this phenomenon.

(iv) Write three factors that are helpful to increase the amount of electric current in this experiment.

(v) Write the name of the law which is used to findout the direction of electric current through the solenoid, when this solenoid moves in a magnetic field while magnet kept static.

(vi) Write the indication of each figure in this law.

(vii) Which principle causes the flow of current through this circuit?

(viii) Describe this principle.

(ix) Write the names of three devices, working on the basis of this principle.

(x) Write the energy change in these devices.

2. AB is a conductor
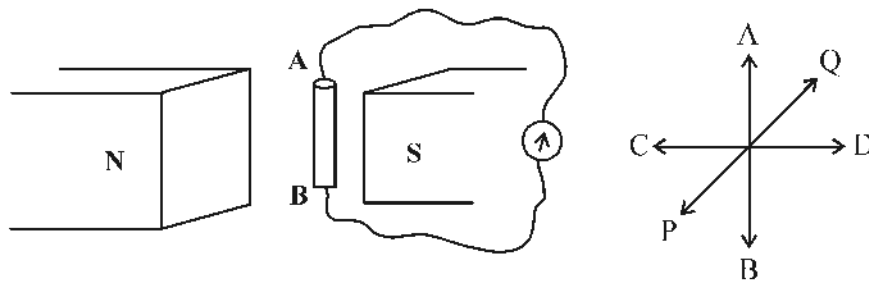
(i) When the conductor AB is moved in the direction PQ, what will be the direction of current ?

(ii) Which law helps us to find the direction?

(iii) State the law.

3. **Observe the figure**
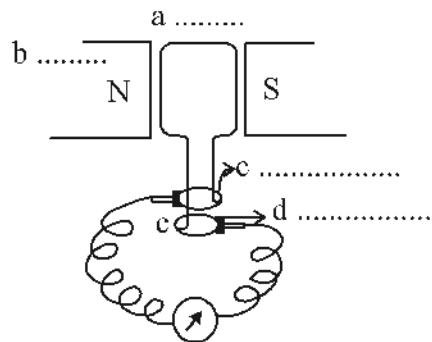
(i) Identify the device shown in the figure.

(ii) What is the working principle of this device?

(iii) Name the parts a, b, c, d .

(iv) When the part 'a' is perpendicular to the flux lines from N to S, then flux is maximum. But induced current is zero. Why ?

4. Graphs given below show the current produced by two different types of generators.
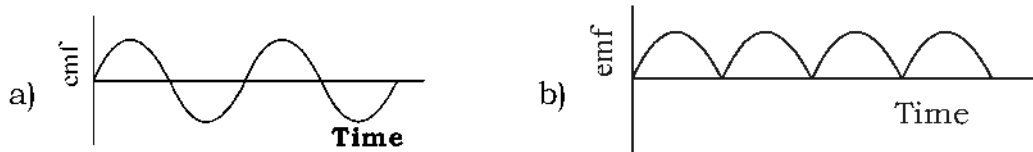
(i) Name the generators.

(ii) Choose the generator suitable for the given statements.

1 Produces alternating current.

2. Use splitring commutator.

3. Use sliprings.

5. **Observe the figure.**
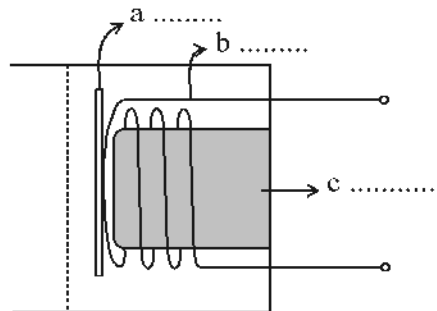
(i) Which is the device shown in the figure?

(ii) Name the parts a, b, c ?

(iii) What is the working principle of this device?

(iv) Write the energy change in this device?

(v) Explain the working of the given device.

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

6.   Observe the figure.
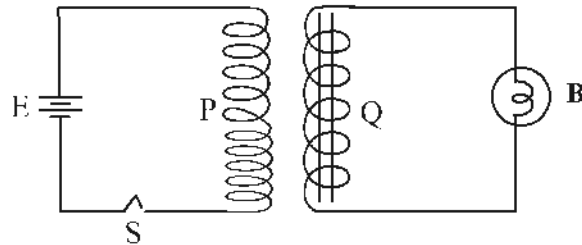
When the switch S is turned on, the bulb suddenly glows and it turns off.

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

(ii)   Name the phenomenon behind this.

(iii) Define it.

(iv)   Name a device that can be made use of this phenomenon.

(v)   Without changing the voltage of battery and the power of bulb, suggest a method to increase the intensity of the bulb.

(vi)   We are the names of the coils P,Q called?

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

(i)   Differentiate the statements given below, suitable to the stepup and step down transformers.

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

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

     (c)   Input voltage is greater than output voltage.

     (d)   Output voltage is greater than input voltage.

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

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

     (g) Input current is greater than output current.

     (h)   Output current is greater than input current.

8.   A student connects 5 insulated copper wires of same length to 5 circuits as shown in the figure.

a)   b)

c)   d)

soft iron

e)
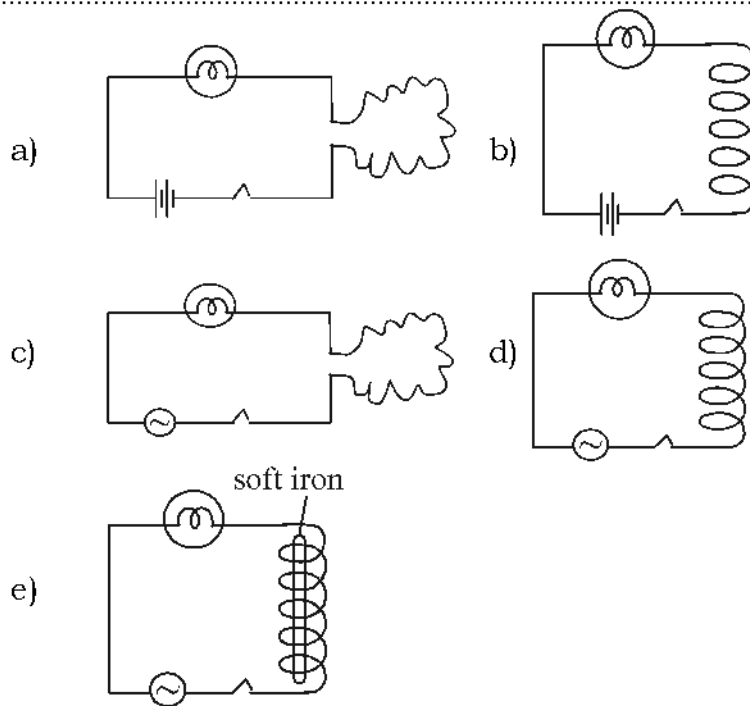
(i)   Compare the intensity of light in each bulb.

(ii)   What is the phenomenon due to which the intensity of light decreases ?

(iii)   Define that phenomenon.

(iv)   Name a device that work based on this phenomenon

(v)   Write one limitation of this device.

(vi)   How does the soft iron core in circuit (e) affect the flow of current in the circuit ?

9.   (i) **Fill in the spaces with appropriate answers.**

SI No.	Vp	Np	Vs	Ns
(i)	20V	400	(a)....	1600
(ii)	50V	(b)....	100V	800
(iii)	(c).....	600	120v	1800
(iv)	100V	3200	25V	(d)....

(ii) Which serial number represents step-down transformer.

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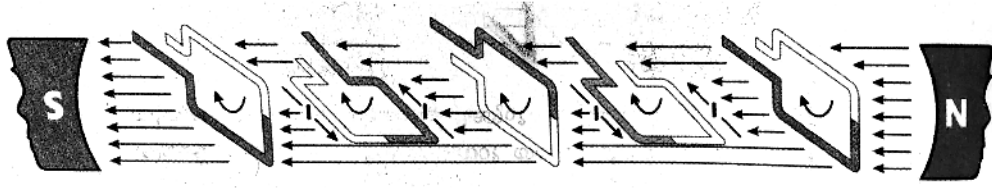
(i)   Find out the positions of the armature in the figure which have zero induced current, when it rotate in a magnetic field.

(ii) What is the frequency of AC current generate in our country for distribution?

11. **Fill in the blanks with appropriate answers**

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

12. Calculate the number of turns in the secondary coil of a transformer working in a 240V AC supplies a voltage of 6V. The number of turns in the primary coil is 4000.

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

14. Find out the primary voltage and secondary current of a stepup transformer having 500W power. Its secondary voltage is 100V and primary current is 1A.

15. Observe the following groups and identify the devices from which those type of emfs are obtained.

(a)   (b)   (c)
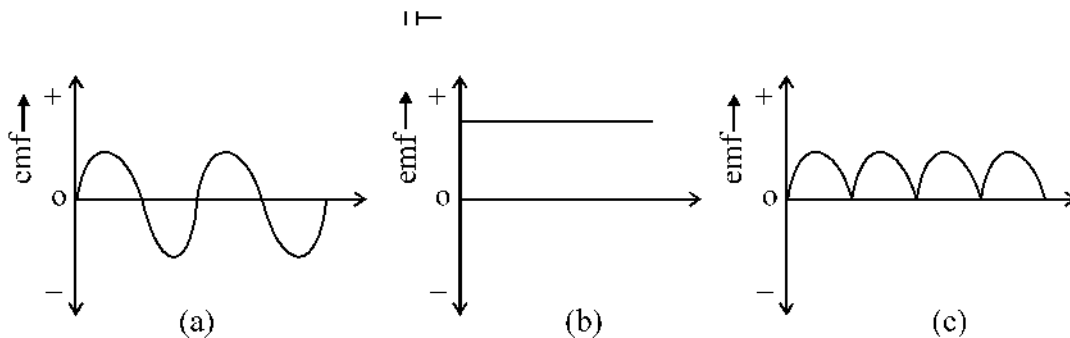
16. Categorise the following relations in to step up/step down transformers

    1. $V_S > V_P$ 3. $V_S < V_p$ 5. $I_S < I_p$

    2. $I_S < I_p$ 4. $\dfrac{N_S}{N_p} < 1$ 6. $\dfrac{N_S}{N_p} > 1$

17. Observe the following electric circuits and ansewer the follwing questions

Solenoid
Soft Iron core
⊛3 W   ⊛3 W
6 V DC   6 V AC
(a)   (b)
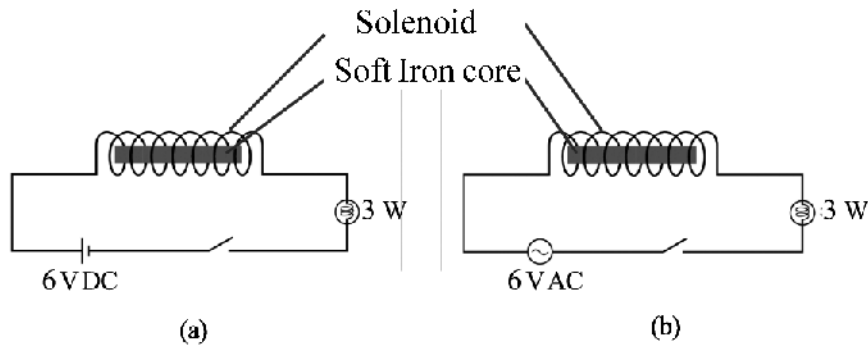
I) Is the bulbs in the circrits glow when the circuits kept switchd on ?

II) In which ciruit the intesity of light from the bulb is low?

III) With a magnetic field be produced arround the solenoids in both the circuit?

IV) In which circuit is a varying magetic field produced around the solenoid?

V) In which of these two solcnoids is on emf induced confinvoulsy?

18. Inductor is a long conductiing wire wound in the form of helix

    I) Inductors are widely used in electronic circuits. What is its necessty

    II) What is the problem of using resistors instead of inductors in ac circuits

    III) Inductors are not used in dc circuits. What is the reason?

19. When the electricity generated in power stations is transmitted to distant place cnergy is lost as heat

    a) What are the methods to minimize the energy loss due to heat?

    b) By what factor will the heat reduce if the current is reduced to half

    c) By what factor will the heat reduce if the current is reduced to $\frac{1}{10}$ th ?

20. State whether the following statements are true or false?

    a) The potential different between earth and nutral line is zero

    b) Neutral line and earth are at different potentials

c) A person touching the nutral lien form the earth will not get an electric shock

d) A person touching the phase line form the earth will not get an electric shock

21. Figure shows a houschold electric circuit.
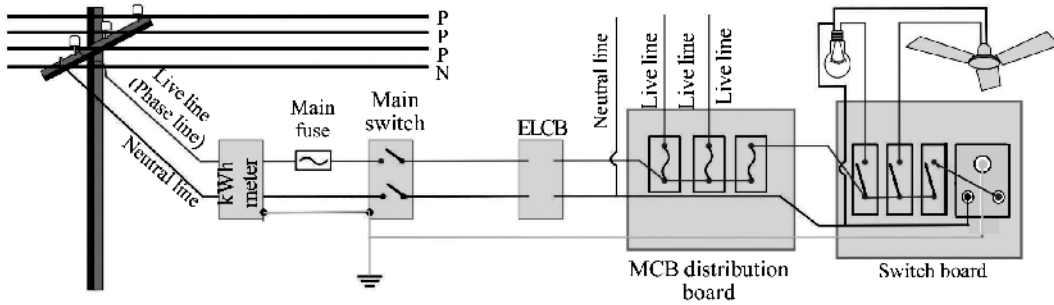
a) In which line is the switches and fuse connected?

b) What are the specialities observed by you in connecting the devices?

c) Give the reasons for connecting the appliances in paralled in a household circuit

22. The incomplete diagram of a domestic electric cirucit is given in figure. Complete the diagram
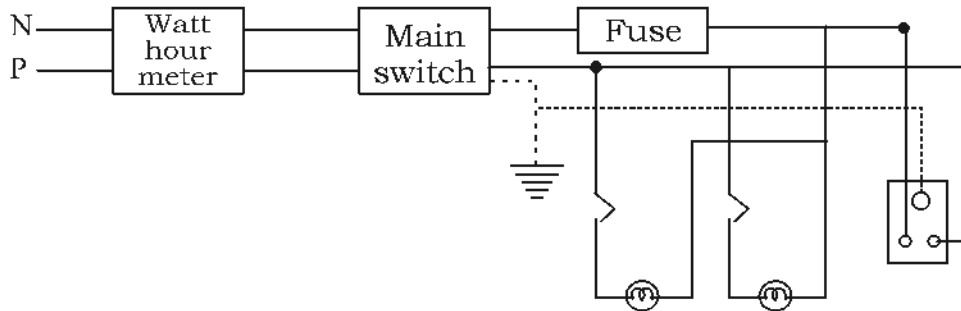
23. A part of a domestic electric circuit is shown in figure. Identify and correct two mostakes in figure.
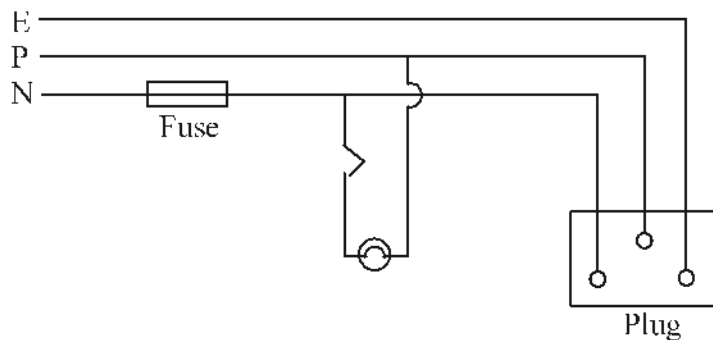
24. a) What is th commercial units of electrical energy?

b) Convert 1 kilowatt hour to watt hour?

c) Name the device used to measure this?

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

e) Why this device is placed at this position?

25. Table shows the power and time of working of some electrical appliances. Calculate the energy expended in lilowalt hour and complete the table.

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

26. In a house, five 20W CF lamps are used for 4 hours, four 60W fans are used for 5 hours and a 100W TV is used for 4 hours daily. Then how many units will be shown in walt hour meter per day?

27. Fuse, MCB, ELCB etc are some safety measures using in a electrical circuit.

a) What are the differences between MCB and electrical fuse

b) What is the advantage of MCB over electrical fuse?

c) What are the functions of ELCB and MCB in a circuit?

28. Now a days it is a common news that persons expire due to electric shock

a) What is the first thing that we should do when a person get an electric shock

b) What are the first aids to the given person got an electric shock?

29. Now a days natural desasters are frequently occuring in our state. When houses get flooded, the possibility of getting electric shock increases.

a) What are the precautions to be taken in such situations

b) What are the precautions to be taken to avoid electric shock?

Answer Key
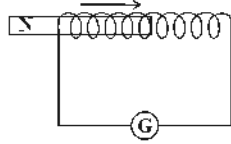
1.	(i)

(ii)	Electromagnetic induction.

(iii)	Correct definition

(iv)	 Use strong magnet, increase number of turns of solenoid, increase speed.

(v)	Fleming's right hand rule

(vi)	Thumb :	Direction of motion of conductor

	Forefinger :	Direction of magnetic field.

	Middle finger :	Direction of flow of current.

(vii)	Electromagnetic Induction

(viii)	Correct definition

(ix)	AC generator, Moving coil microphone, Induction motor

(x)	Mechanical Energy $\longrightarrow$ Electrical Energy

2.	i) AB direction

	(ii) Flemings right hand rule.

	(iii) Correct definition

3.	(i) AC generator

	(ii) Electromagnetic Induction

	(iii) a-armature

		b- field magnet

		c- slip ring

		d- Brush

	(iv) Rate of change of flux is zero

4.	(i)	a.	AC generator

		b.	DC generator

	(ii)	1 - AC generator

		2 - DC generator

		3 - AC generator

5.	(i) Moving coil microphone

	(ii) a- Diaphragm

b- Voice coil

c - Permanent magnet

(iii) Electromagnetic Induction

(iv) Sound energy $\longrightarrow$ Electrical Energy

(v) The voice coil is situated in a magnetic field. The diaphragm connected to the voice coil vibrates in accordance with the sound waves falling on it. As a result, electric signals corresponding to the sound waves are generated.

(vi) Amplifier

6. (i) Provide AC current as input current

(ii) Mutual induction

(iii) Correct definition.

(iv) Transformer

(v) Increase the number of turns in coil Q.

(vi) P - Primary coil

Q- Secondary coil

7. (i)

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

8. (i) Bulbs in a, b, c are emitting same light.

Glow of d is lesser than a, b, c.

'e' has the least glow.

(ii) Self induction

(iii) Correct definition

(iv) Inductor

(v) Cannot use in DC circuits.

(iv) The presence of soft iron core leads to the increase in flux density. So back emf increases, which leads to the decrease in effective voltage.

9. (i) (a) 80V

(b) 400

(c) 40V

(d) 800

(ii) SINo. (iv)

10. (i) a, c, e

(ii) 50Hz

11. (a) 10V

(b) 2A

(c) 3A

(d) 12V

12. Vs = 6V, Vp = 240V, Np = 4000, Ns = ?

$$\frac{Vs}{Vp} = \frac{Ns}{Np}; Ns = \frac{VsNp}{Vp} = \frac{6 \times 4000}{240} = 100$$

13. Np = 2500

Ns = 500

Vs = 40V

Is = 5A

Vp = ?

Ip = ?

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

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

$$= 200V$$

$$Vp \times Ip = Vs \times Is$$

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

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

$$= 1A$$

14. P = 500W

Vs = 100V

Ip = 1A

Vp = ?

$$P = Vp \times Ip$$

$$Vp = \frac{P}{Ip}$$

$$\frac{500}{1}$$

$$= 500V$$

$$P = Vs \times Is$$

$$Is = \frac{P}{Vs}$$

$$= \frac{500}{100}$$

$$= 5A$$

15. a) Ac generator

    b) Cell

    c) Dc generator

16. 1) Step up   3) Step down   5) Step down

    2) Step down   4) Stepdown   6) Step up

17. I) Yes   II) b   III) Yes   IV) b   V) b

18. I) To reduce current without power loss

    II) Powerloss/electric energy is converted in the heat energy

    III) Self induction does not occure

19. I) Reduce current and resistance

    II) decreases to $\frac{1}{4}$ th

    III) decreases to $\frac{1}{100}$ th

20. 1) True

    2) False

    3) True

    4) False

21.   1) Phase line

2) Devices are connected in paralled, connected between phase line and neutral

3) To controll different devices by using different switches

22.
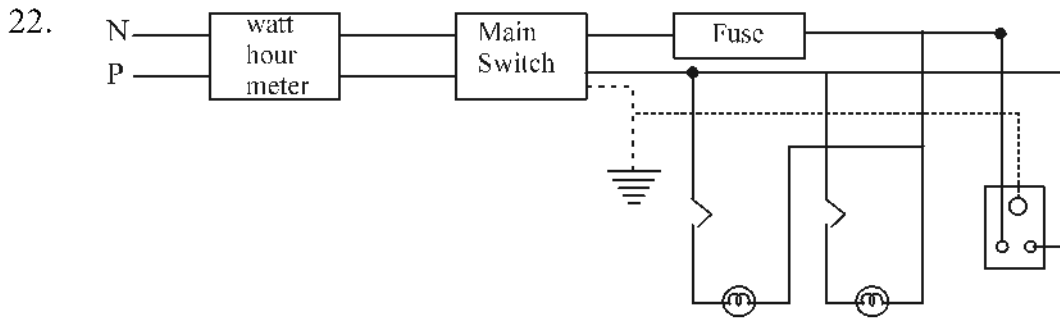
23.   1) Fuse is connected in neutral line

2) Phase line is conncted to earth

3) Switch is connected in neutral

24.   1) Kilowatt hour

2) 1000 watt hour

3) Kilowatt hour meter

4) At the beginning

5) To measure electric energy consumed

25.   1) 1.2

2) 0.72

3) 0.45

4) 1.8

5) 1.5

26.   CFL $20 \times 5 = 100$ W

$$Kwh = \frac{100 \times 4}{1000} = 0.4$$

Fan $60 \times 4 = 240$

$$kwh = \frac{240 \times 4}{1000} = 1.2$$

TV $= 100 \times 1 = 100$ w

$$kwh = \frac{100 \times 1}{1000} = 0.1$$

27. 1) Fuse – heating effect

MCB – Magnetic effect

2) MCB & Self controlled device

3) When current in the circuit becomes greater ELCB and RCCB automatically switched off the cirut

28. 1) Detach person from electric supply

2) Any relevent answers

29. 1) Switch off the main switch in the house

2) Any relevant answers

UNIT TEST

Time : 45 mts   Max: Score: 20

Find out the relation of first pair and then complete second pair.

1.   AC generator : Electromagnetic induction

Transformer :   1

2.   Moving coil loud speaker : Sound energy ⟶ Electrical energy

Power generator :   1

Answer any two questions from 3 to 5

3.   Inductor is a device that can reduce the flow of current with out powerloss.   2

(i)   What is the main limitation of this device?

(ii)   What problem arises when an inductor is replaced by a resistor in a circuit.

4.   What kind of a transformer is represented by the formula $\frac{Ns}{Np} < I$?

What is the formula for finding out the emf of the primary coil? 2

5.   a. What are the problems faced in the electrical power transmission?

b. What are the solutions adopted to solve these problems?

Answer any two questions from question nos. 6 to 8

6. Given are the pictures of experiments, done by a student using insulated copper wires of equal length and bulbs of equal power. 3
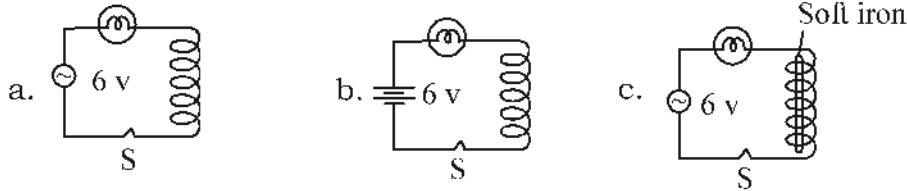
When the switches are turned on:

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

(ii) Why do the bulbs have different intensity even though they have same power? Explain.

(iii) Which is the phenomenon that causes the decrease in intensity of bulbs ?

7. Given below are the circuits made by insulated copper wire. 3
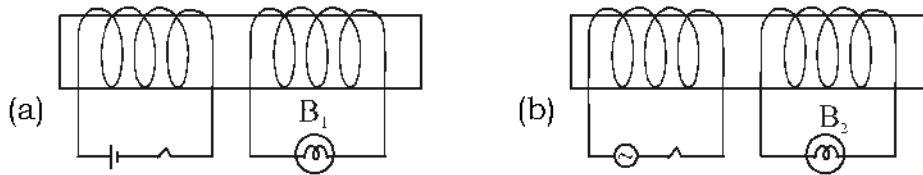
(i) In which circuit does the bulb glow continuously?

(ii) Which is the phenomenon that causes the continuous glowing of bulb?

(iii) Name a device which works on this phenomenon?

8. Find the secondary voltage and number of turns in primary coil of a transformer having primary current 5A, secondary current 0.5A, primary voltage 10V and number of turns in secondary coil 100 3

9. **Observe the figure** 4
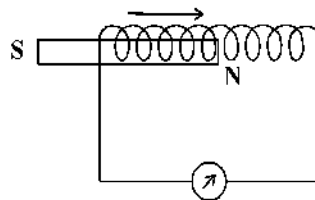
Electric current is produced in the circuit when an experiment is

setup as shown in the figure.

(i) Which phenomenon is the reason for the flow of electric current through the circuit.

(ii) Write the definition of this phenomenon.

(iii) Name three factors through which the amount of electricity can be increased.

10. You have noticed in electrical appliances three pin plug connected to three pin socket.

a. What is the purpose of connecting three pin plug?

b. Which line does come in contact with the earth pin?

c. Why is earth pin made different in this way?

d. Which part of the instrument is connected to the earth pin?

e. How can safety be ensured by using a three pin plug?

Answer Key

Sl	DESCRIPTION	Score
1.	Mutual induction	(1)
2.	Mechanical energy $\longrightarrow$ Electrical energy	(1)
3.	(i) Can't use in DC circuit	(1)
	(ii) Loss of electricity in the form of heat energy.	(1)
4.	Step down transformer.	(1)
	$V_p = N_p \times e$	(1)
5.	a. The problems faced when electrical power is to be transmitted to distant places are voltage drop and power loss.	(1)
	b. When electricity passes through a conductor the energy loss depends mainly on the square of intensity of current and the resistance of conductor. The energy loss can be minimised by reducing the strength of current $H = I^2Rt$. As per equation $P=VI$, with out power loss we can reduce current by increasing voltage proportionally. The voltage can be increased by using step up transformer. Thus by increasing the voltage and by reducing the strength of current proportionally, will minimise the heat loss during the transmission of electricity.	(3)

6.	(i) b, a, c	(1)
	(ii) No back emf in 'b' so maximum intensity Highest back emf in 'c' so least intensity.	(1)
	(iii) Self induction	(1)
7.	(i) b	(1)
	(ii) Mutual induction	(1)
	(iii) Transformer	(1)
8.	Ip = 5 A	(1)
	Is = 0.5A	
	Vp = 10V	
	Ns = 100	
	Vs = ?	(1)
	Np = ?	
	Vs × Is = Vp × Ip	

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

$$= \frac{10 \times 5}{0.5}$$

$$Np = \frac{Ns \times Vp}{Vs} \qquad (1)$$

$$= 100 \qquad\qquad = \frac{100 \times 10}{1}$$

$$= 10A$$

9.	(i) Electromagnetic Induction	(1)
	(ii) Correct definition	(1)
	(iii) Increase the number of turns of the coil,	(1)
	Increase the strength of magnet,	
	Increase the movement of magnet or coil	(1)
	Increase the area of conductor	
10.	a. Inorder to ensure safety to electrical appliances.	(1)
	b. Earthline	
	c. In order to reduce resistance. The low resistance of earthwire causes more quantity of current to pass through it and gives perfect earthing.	(1)
	d. The metal body of electrical appliance is connected to the earth pin	(1)
	e. In case the metal body of the electrical appliance comes in contact with a live wire, electricity will flow to the earth through the earthpin of the three pin plug. Hence, accidents due to electric shock can be avoided.	(1)

Unit 4

REFLECTION OF LIGHT

Light

Laws of Reflection

Regular Reflection | Irregular Reflection

Mirrors

Spherical Mirror

Plane Mirror

Image formation in plane Mirror $n = \dfrac{360}{\theta} - 1$

Concave Mirror

Convex Mirror

Nature of Images formed in Spherical Mirrors

Uses of Spherical Mirrors

New Cartesian Sign conversion

Mirror Formulae

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

Magnification

$$m = \frac{-v}{u} = \frac{hi}{ho}$$
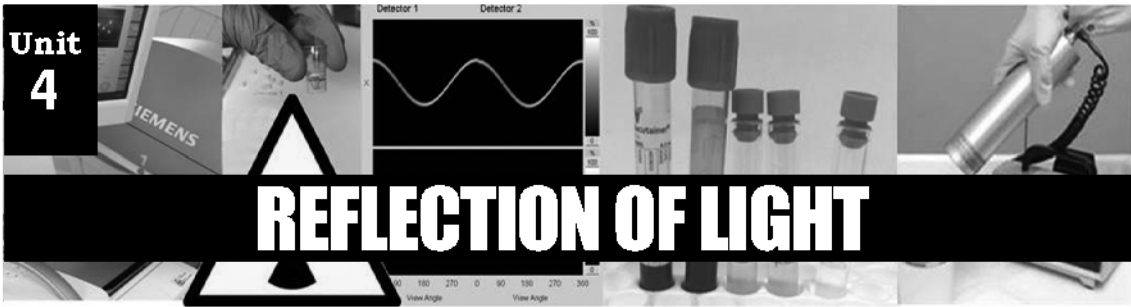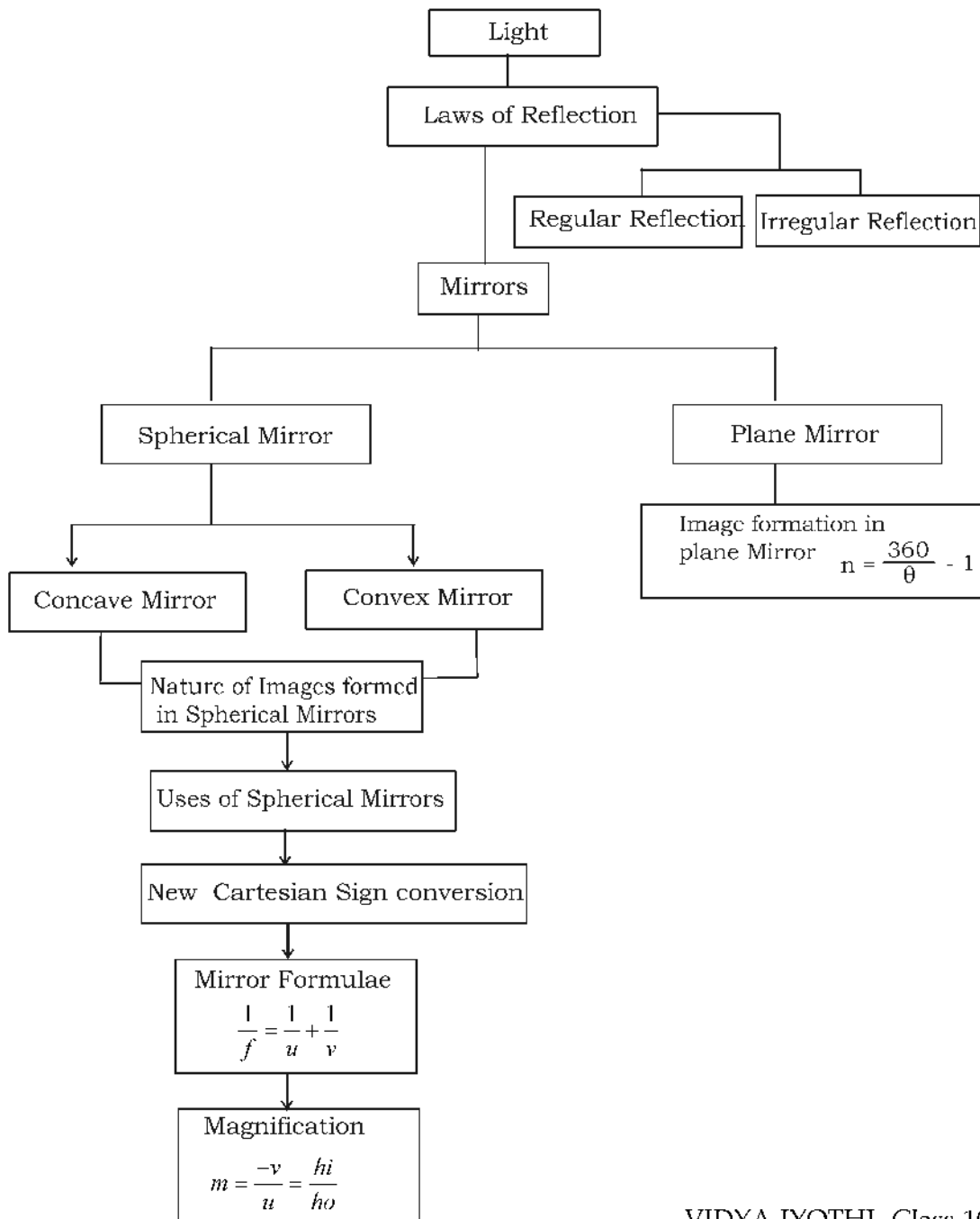
Points to remember

◆ Laws of Reflection
◆ Regular reflection
◆ Scattered reflection
◆ Multiple reflection – Equation formation
◆ Field of view
◆ Uses of mirrors
◆ Uses of mirrors
◆ Focal length
◆ Mirror Equation
◆ New Cartesian Sign Convention
◆ Magnification

◆

◈ **Laws of reflection**

When light is reflected from a smooth surface , the angle of incidence and angle of reflection are   equal

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

◈ When light falls on a smooth surface, it undergoes a regular reflection.

◈ When light falls on a rough surface it undergoes an irregular reflection.

◈ After regular reflection the light rays travel parallel.

◈ The field of view of a mirror is the maximum range of the vision through the mirror.

◈ New Cartesian Sign Convention

In all experiments related to lens and mirrors the distances are measured in the same way as in graphs

Distance are measured considering the pole of the mirror as the origin

Those measured to the right from O are positive and those in the opposite direction are negative.

Distance measured upwards from X axis are positive and those downwards are negative.

The incident ray is to be considered as travelling from left to right.

❖ Magnification

The ratio of the height of the image to the height of the object is magnification.

❖ Magnification = 1, Size of the image = Size of the object

❖ Magnification > 1, Size of the image > Size of the object

❖ Magnification < 1, Size of the image < Size of the object

❖ Magnification positive – Image erect and virtual

❖ Magnification negative – Image inverted and real

Important Equations

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

θ = Angle between mirrors

Focal length $(f) = \dfrac{uv}{u + v}$

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

f- Focal length, U- Distance to object from the mirror, V-Distance to the image from the mirror.

Magnification m = $\dfrac{hi}{ho}$

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

hi-Hight of image

ho-Hight of object

<div style="background:black;color:white;text-align:center">ACTIVITY</div>

Concave mirror, Convex mirror, Plain mirror

1. | Concave mirror, Convex mirror, Plane Mirror |

   Choose the appropriate from the box for the following statements

   (a) Used for observing the face

   (b) Used as rear view mirror in vehicles.

(c) Use in Solar Furnace

(d) Use in the search lights.

(e) Used by the Dentist for observing the teeth.

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

A	B	C
Object between C and F	Image at C	Image of the same size as object
Object beyond C	Image beyond C	Magnified Image
Object at C	Image between F and C	Diminished image

3. Two plane mirrors are arranged in such a way that their edges are in contact and the angle between the mirror is 60^0 Find out the images formed in between the mirrors?

4. Choose the correct statements from the following with respect to the plane mirrors.

(a) Virtual image is formed.

(b) Real image is formed.

(c) Magnified image formed

(d) The distance to image and distance to object from the mirror will be equal.

5.
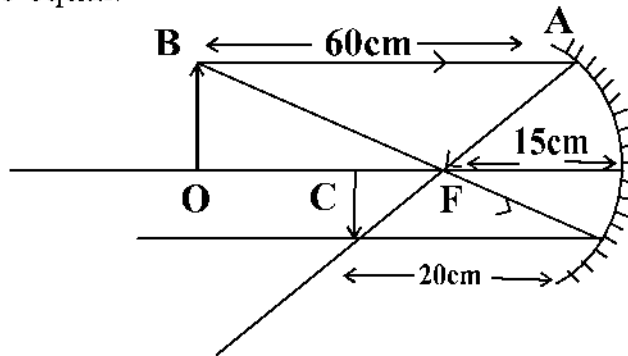
Observe the figure

(a) Identify the type of mirror.

(b) From the figure find out u, v and f

(c) Determine the magnification

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

(a) What will be the position of the object?

(b) What will be the position of the image?

(c) Write the characteristics of the image?

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

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

(a) Identify which type of mirror?

(b) Why do such mirrors are used as the rear view mirrors?

(c) What will be the focal length of the mirror?

(d) Find the magnification of the image?

9. When two plane mirrors are arranged at a certain angle, 9 images are formed in between them. Determine the angle between the mirrors?

10. Identify the relation and fill suitably

To observe face: Plane mirror

Rear view mirror: ....

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

12. Did you noticed the writing "The objects in the mirror are closer than they appear"?

(a) In which type of mirror this information is written?

(b) What is the necessity of this statement?

13. An object is placed 16 cm away from the centre of a polished sphere of diameter 24 cm.

(a) Which type of mirror will be this sphere?

(b) What will be the position of the image?

(c)Determine the magnification of the image?

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

(a) what will be the height of the image?

(b) Determine the magnification of the image?

ANSWER KEY

1. (a) Plane mirror

(b) Convex mirror

(c) Concave mirror

(d) Concave mirror

(e) Concave mirror

(f) Concave mirror

2.

A	B	C
Object between C and F	Image beyond C	Magnified Image
Object beyond C	Image between F and C	Diminished Image
Object at C	Image at C	Image of the same size as object

3. $n = \dfrac{360}{\theta} - 1$

$\quad = \dfrac{360}{\theta} - 1$

$\quad = (6-1)$

$\quad = 5$

4. (a), (d)

5. (a) Concave mirror

(b) u= -60cm

$\quad$ v= -20cm

$\quad$ f= -15cm

(c) Magnification = -v/u

$\qquad = -\left(\dfrac{-20}{-60}\right)$

$\qquad = {-1}\big/{3}$

6. (a) At C

(b) A t C

(c) Image of the same size as object

7. u= –30cm

$\quad$ f = –12

$\quad \dfrac{1}{f} = \dfrac{1}{v} + \dfrac{1}{u}$

$\quad \dfrac{-1}{12} = \dfrac{1}{v} - \dfrac{1}{30}$

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

$$v = \frac{-360}{18} = -20$$

Image formed 20 cm away from the mirror

8. (a) Convex mirror

    (b) Since the field of view is more

    (c) $f = \dfrac{uv}{u+v} = \dfrac{12 \times -20}{-80} = 30$ m

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

9. $n = \dfrac{360}{0} = -1$

    $9 = \dfrac{360}{0} = -1$

    $10 = \dfrac{360}{\theta}$

    $\theta = 36^0$

10. Convex mirror

11. m = +2

    u = -20

    $m = \dfrac{-v}{-20} = \dfrac{-v}{u}, \ 2 = \dfrac{-v}{-20}$

    v = 40 cm

12. (a) Convex mirror

    (b) The image will be always between P and F

    It provides more field of view

13. (a) Convex mirror

    (b) f = + 6 cm

    u = –6 cm

    $\dfrac{1}{5} = \dfrac{-1}{6} + \dfrac{1}{v}$

$$\frac{1}{v} = \frac{2}{6}$$

v = 3 cm

(c) Magnification

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

$$= \frac{-3}{-6} = \frac{1}{2}$$

14. (a) Height of image

$$= \frac{-v}{u} = \frac{hi}{ho}$$

$$hi = \frac{-16 \times 6}{8} = {}^-12 \text{ cm}$$

(b) Magnification=

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

$$= \frac{-12}{ho} = \frac{-12}{6} = -2$$

Unit Test

Std : 10   **Time : 40m**

Answer both the questions

1. What will be the magnification of the image formed by a plane mirror?

2. Which type of mirror is used by the Dentist to examine the teeth?

Answer any two questions from 3 to 5 (Each one carries 2 marks)

3. A student arrange two plane mirrors to make images by the multiple reflection. Find out the number of images if the angle between the mirrors is 45?

4. Find out the wrong statement and correct it

   (a) The magnification of the image formed by a convex mirror will not be negative.

   (b) In all the experiments related with the mirrors distances are measured from the principal focus.

5. Complete the ray diagram to form the image of the object OB
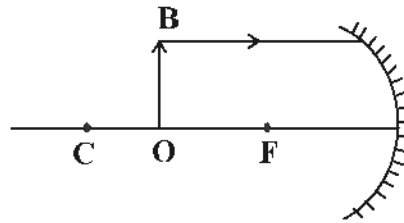
Answer any two questions from 6 to 8 (Each one carries 3 marks)

6. Analyse the statements given below and identify the mirrors

   (a) The image will be always smaller than the object, virtual and erect.

   (b) The image is formed behind the mirror, the distance of the object from the mirror and image will be equal.

   (c) The position and nature of the image changes with respect to the change in the position of the object.

7. When an object is placed in front of a concave mirror at a distance 30 cm an image is obtained on a screen at a distance 15 cm from the mirror. Find the position of the image? What will be the nature of the image?

8. The given figure shows the image formation by a concave mirror. Analyse the figure and write down the different measures using New Cartesian Sign Convention.
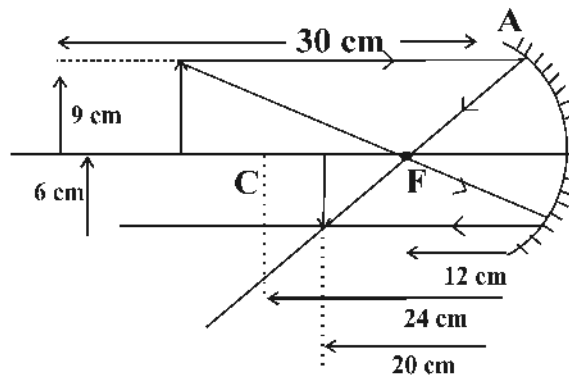
   (a) Focal length (f)
   (b) Radius of curvature (r)
   (c) Height of the image
   (d) Distance of the object from the mirror

(e) Distance of the image from the mirror

(f) Height of the object

Answer both the questions

9. A boy placed a lighted candle in front of a concave mirror at a distance 20 cm. Inverted image of the candle is formed at the same place.

(a) Identify the type of mirror used by the boy?

(b) What will be the focal length of the mirror?

(c) Find out the magnification?

10. Bulb in a torch light is arranged in such a way that the rays of light from the bulb are parallel.

(a) What type of mirror is used as the reflector in the torch light?

(b) Write another use of this type of mirrors?

(c) How does the position of the bulb is arranged to make the light rays parallel? Justify your answer.

Answer Key

1. Magnification

2. Concave mirror

3. (same as mal medium)

4. (a) True

(b) In all the experiments related with the mirrors distances are measured from the pole

5.
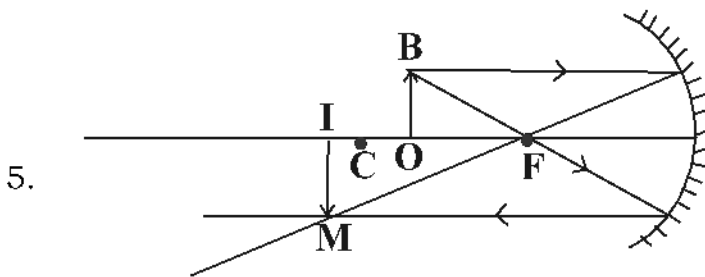
6. (a) Convex mirror

(b) Plane mirror

(c) Concave mirror

7. $f = -30\text{cm}$

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

$u = -15\text{cm}$

$$= \frac{15 \times 30}{^-15 - ^-30}$$

$v = ?$

$$= \frac{^-15 \times ^-30}{^-15 - ^-30} = \frac{^-15 \times ^-30}{15}$$

$$= 30\text{cm}$$

8. a) $^-12$ cm   d) ^-30cm

    b) 24cm   e) 20cm

    c) 6cm   f) $+ 9\text{cm}$

9. (a) Concave mirror

    (b) $f = -10\text{cm}$

    (c) Magnification = 1

10. (a) Concave mirror

    (b) Any one device

    (c) At the principal focus

    Reflected rays travel parallel long distance

಄಄

Unit 5

Refraction of light

```
                          ┌─────────────┐         ┌──────────────────────┐
                          │ Refraction  │─────────│ Practical application │
                          └─────────────┘         │ of refraction in daily life │
                                 │                 └──────────────────────┘
                          ┌─────────────┐
                          │    Lens     │
                          └─────────────┘         ┌──────────────────────┐
  ┌──────────────────────────┐                    │ Atomospheric refraction │
  │ Refraction in different media │                └──────────────────────┘
  └──────────────────────────┘
  ┌──────────────────┐         ┌────────┐
  │ Optical density  │         │ Convex │        ┌─────────┐
  └──────────────────┘         └────────┘        │ Concave │
  ┌──────────────────┐                           └─────────┘
  │ Laws of refraction │
  └──────────────────┘
                              ┌───────────────────────────┐
                              │ Image formation - raydiagram │
                              └───────────────────────────┘
  ┌──────────────┐            ┌───────────────────────────┐
  │ Snell's law  │            │ New cartesian sign convention │
  └──────────────┘            └───────────────────────────┘
  ┌──────────────┐   ┌────────────────────────┐      ┌───────────────┐
  │ n = sin i/sin r │ │ Total internal reflection │    │ Magnification │
  └──────────────┘   └────────────────────────┘      └───────────────┘
  ┌──────────────┐                              ┌───────────────┐
  │ Refractive index │                          │ Power of lens │
  └──────────────┘                              └───────────────┘
  ┌────────────────────────┐
  │ Relative refractive index │
  └────────────────────────┘
```
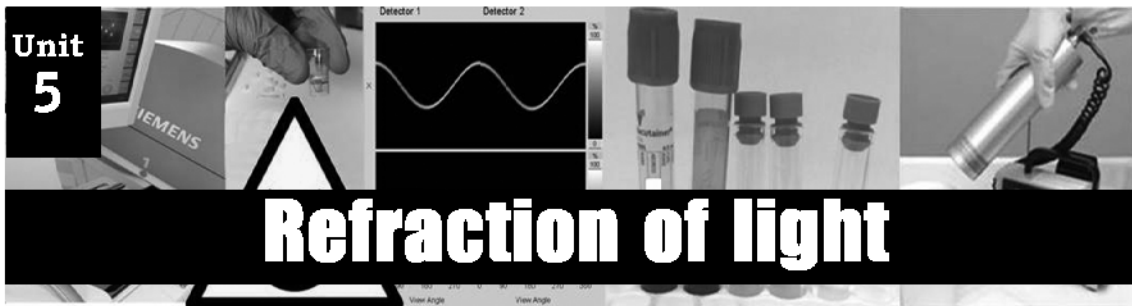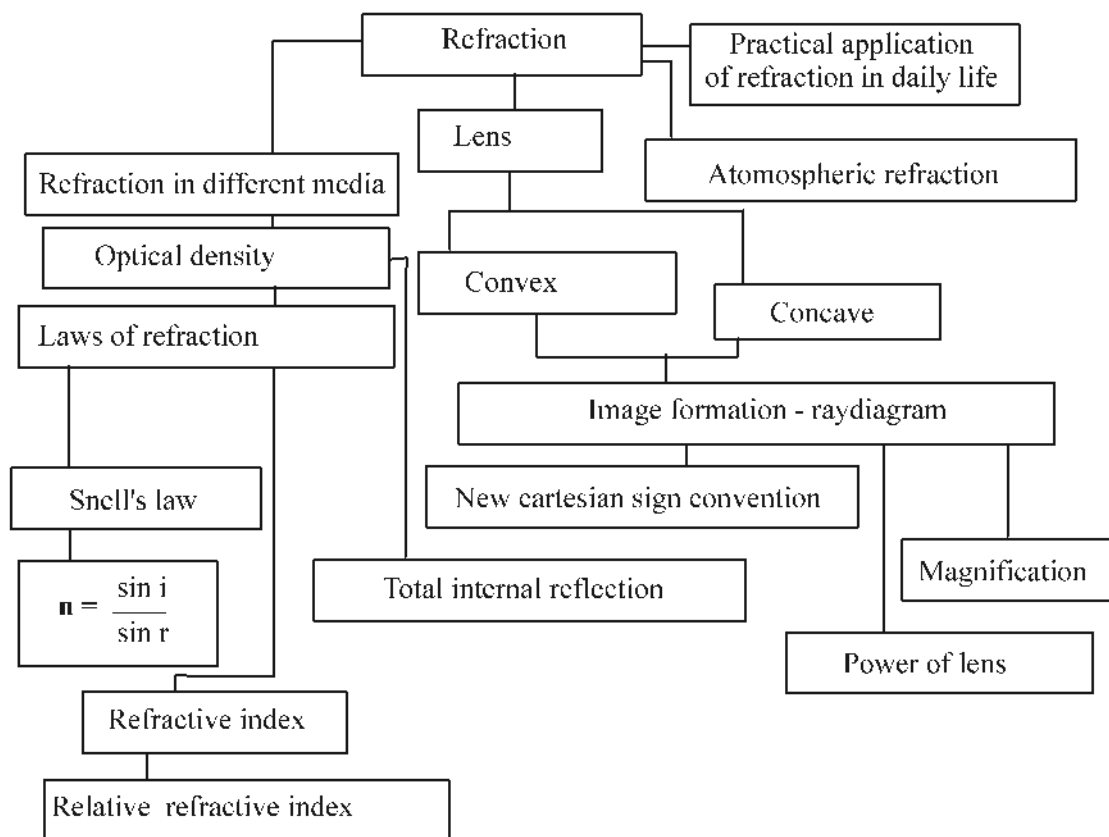
Points to remember

❖ The ratio of the sine of the angle of incidence to the sine of the angle refraction $\dfrac{\text{Sin i}}{\text{Sin r}}$ will always be a contact. This is known as Snell's law

❖ $\dfrac{\text{Sin i}}{\text{Sin r}} = \text{W}$

❖ n = Refractive Index

❖ The refractive index of one medium with respect to another is called relative refractive index.

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

❖ Refractive index = $\dfrac{\text{Speed of light in air}}{\text{Speed of light in medium}}$

$$n = \dfrac{C}{V}$$

❖ When a ray of light passes from a medium of greater optical density to that of lower optical density, the angle of incidence at which the angle of refraction become 90^0 is the critical angle.

❖ When a ray of light passes from a medium of higher optical density to a medium of lower optical density at an angle of incidence greater than the critical angle, the ray is reflected back to the same medium without undergoing refraction. This phenomenon is known as total internal reflection

❖ A lens is a transparent medium having spherical surfaces.

❖ Principal axis is the imaginary line that passes through the optic centre joining the two centres of curvature.

❖ A convex lens has real principal focus.

❖ A concave lens has virtual principal focus.

❖ Nature of image formed by convex lens depends on the position of the image

❖ A concave lens always forms virtual image.

❖ Magnification of real image is negative

❖ Magnification of virtual image is positive.

Magnification

Magnification = $\dfrac{\text{height of the image}}{\text{height of the object}}$

$$m = \dfrac{hi}{ho}$$

$$m = \frac{\text{Image distance}}{\text{Object distance}}$$

$$m = \frac{V}{U}$$

❖ If magnification is +ve the image will be virtual and erect.

❖ If the magnification is –ve, the mage will be real and inverted

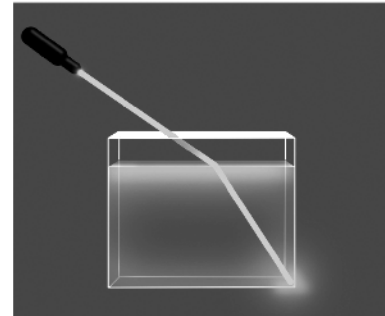**Power of Lens** : Power of a lens in the reciprocal of focal length expressed in metre.

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

❖ If the power is –ve, the lens is concave lens.

❖ If the power is +ve, the lens in convex lens

The unit of power is droplet (D)

ACTIVITY

1. Figure shows the path of the light from a laser torch that passes through water taken in beaker.

   a) Name the phenomenon responsible for the deviation of the path of light

   b) Give a definition of this phenomenon

   c) What is meant by optical density

   d) What is the relation between optical density and velocity of light

   e) Arrange the following media in the descending order of their optical density

   (glass, water, diamond, air)

2. Given below are the different figures in which light passes obliquely from one medium to the other AB is the normal.
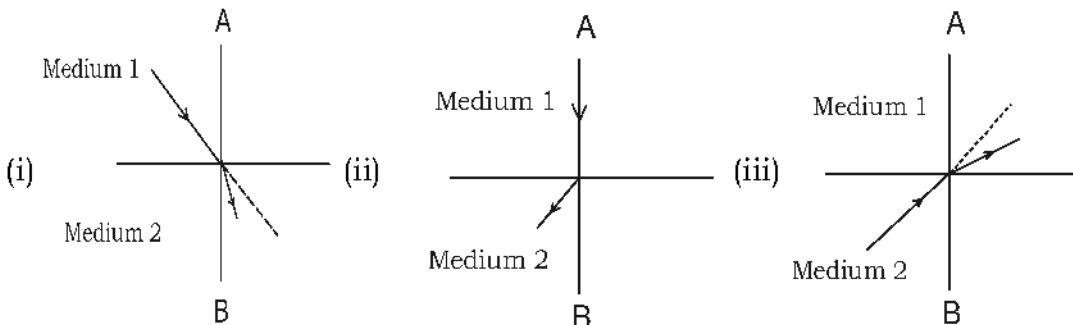
a) Which of the figures indicates the path of the light ray passes from air to water?

b) What is the reason for choosing this figure as the answer

c) Which of the figures indicates the path of light ray passes from glass to water?

d) In these figures, which one is wrong?

3. Figure shows the path of laser light that passes obliquely through a glass prism
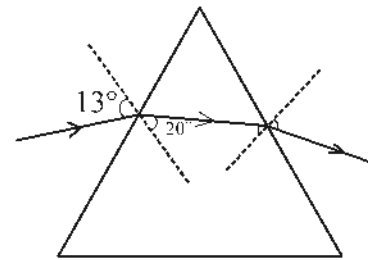
a) The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant. Name the constant. Name this law.

b) Identify the letter that represents this constant

(i, n, r, v, e)

c) As shown in figure when light ray passes obliquely from air to gas, find out the value of refractive index on the basis of Snell's law. (sin 13°= 0.34, sin 20° = 0.22)

d) When a ray of light passes obliquely from one medium to another medium "The angle of incidence of the angle of refraction and the normal at the point of incidence on the surface of separation of the two media will always be in different plane. Correct the statement, if it is wrong.

e) When a ray of light passes from one medium to another medium, what is the relation between angle incidence and angles of refraction

4. Observe the fig.and answer the following question

a) Don't you see that the position of the portion of the pencil under water has changed? What may be the reason.

b) Does the ray of light coming after reflection from the pencil undergo a deviation? What is the reason.

c) Is there any change likely to occur if kerosene is used instead of water?

5. (a)

air

glass

30°

(b)

air

glass

42°

(c)

air
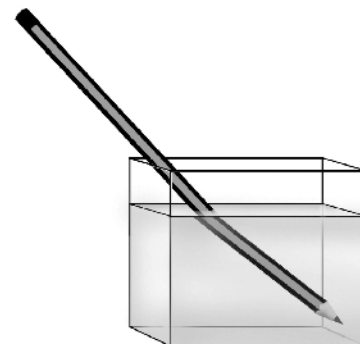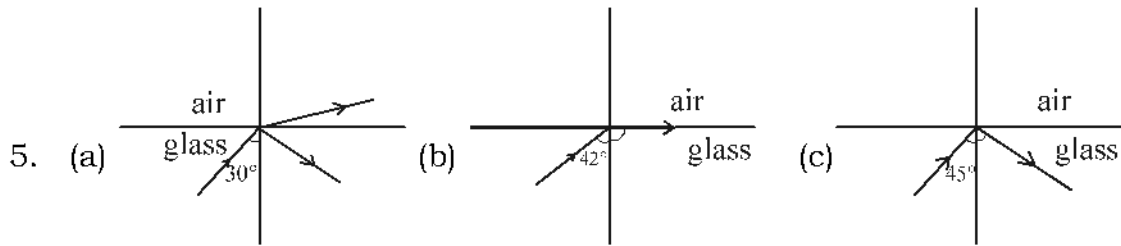
glass

45°

Observe the above figure and answer the following question

a) What is the critical angle of glass

b) Define critical angle.

c) Write the condition under which a light ray undergoes total internal reflection.

d) Write any two practical applications of total internal reflection in our day to day life.

6. Velocity of light through some mediums are given below

Glass	$2 \times 10^8 \, m/s$
Water	$2.25 \times 10^8 \, m/s$

a) Calculate the absolute refractive index of glass and water.

b) Define relative refractive index

c) What is the refractive index of water with respect to glass

d) Calculate the refractive index of glass with respect to water

7. Refractive index of some mediums are given below analyse the table and answer the following question.

| Medium	Refractive index
Water	1.33
Sunflower Oil	1.47
Diamond	2.42
Kerosene	1.44

a) Choose the mediums of highest and lowest optical density from the table.

b) What are the medium having highest and lowest velocity of hight.

c) If the refractive index of Diamond with respect to water is 0.54 then what is the refractive index of water with respect to diamond

8. Refractive index of some medium are given below

Medium	Refractive index
Water	1.3
Sunflower Oil	1.47
Pyrex glass	1.47
Glycerine	1.47

Glycerine, water and sunflower oil are taken in two beakers. A glass rod in dipped in one and a pyrex glass rod is in dipped in the other.

a) Do the glass rod and pyrex glass rod appear in the same way.

b) In which media are they visible, Justify your answer.

9. Observe the following figure and answer the following question.
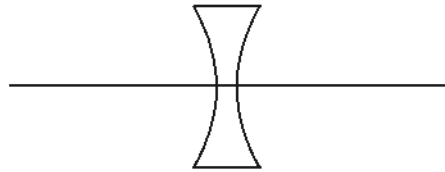
a) Identify the lens given in the figure

b) What is the nature of the principal focus of this lens

c) Justify your answer

d) Can you project image of an object on a wall by using this lens.

e) Give one use of this lens

10. Correct the following figures if wrong
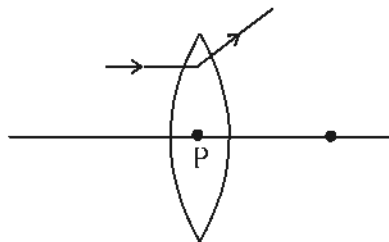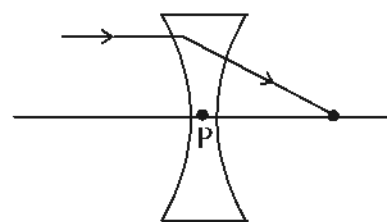
(a)   (b)

11. Complete the figures and answer the following question

(a)

(b) What is position, nature and size of the image?

12. Write the measures given in the figures by new Cartesian sign convention.
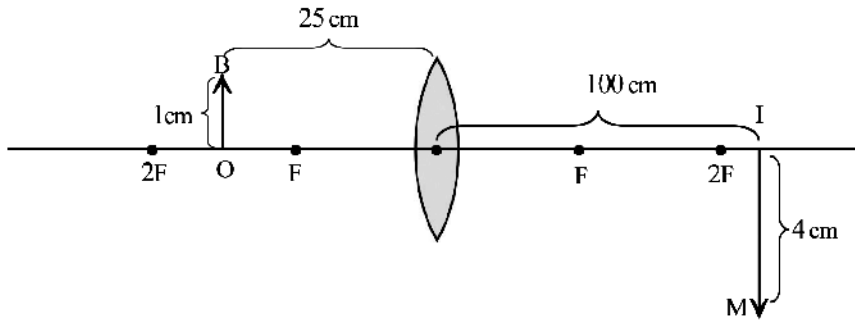
a) Object distance (d)

b) Image distance (v)

c) Height of the objeet (OB)

d) Height of the image (IM)

e) What is the focal length of this lens
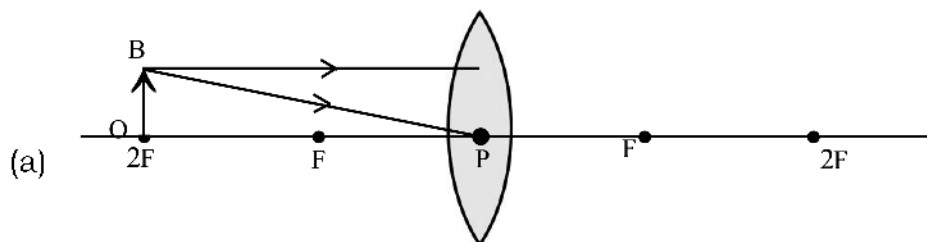
f) Find magnification of image.

13. Analyse the following table and fill in the blanks.

Position of Object	Position of Image	Nature of image/Size		
		Real / Virtual	Inverted/ erect	Magnified/ Diminshed/ Same size
1) At infinity	.......(a)......	Real	inverted	diminished
2) Beyond 2F	Between F and 2 F	.......(b).....	inverted	diminished
3) at 2F	......(c)......	Real	inverted	Same size
4) Between F and 2 F	Beyond 2F	Real	.....(d).......	Magnified
5) at F	At infinity	......(e)......	inverted	Magnified
6) Between F and lens	Behind the lens	Virtual	erect	......(f).......

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

   a) Find the height of the image

   b) Which type of lens is this?

   c) What are the other characteristics of the image

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

   a) Find the magnification of the image

   b) Which type of lens is this

   c) Write any one use of such lens

   d) Find the other characteristics of the image

16. In the prescription of an Ophthalmologist, it is written as – 2.5 D for buying spectacles.

   a) What has the doctor indicted in the prescription

   b) Which type of lens is this

   c) Find the focal length of the lens

17. Calculate the power of a convex lens of focal length 50 cm

18.
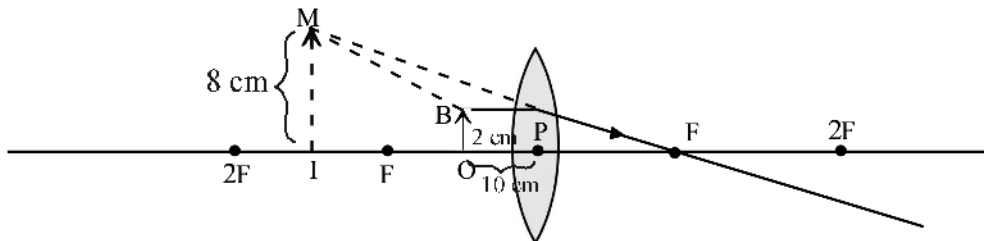
   a) Observe the figure and find the magnification of the image.

   b) Whether magnification is +ve or -- ve ?

   c) Find the position of the image

   d) What are the other properties of the image?

19. Do you see stars twinkle at night? Give a scientific explanation for this in relation with refraction of light.

ANSWER KEY

1. a) Refraction

   b) Practical definition

   c) Ability of a medium to influence the velocity of light

   d) Inversly proportional

   e) Diamond >Glass>Water>Air

2. a) (i)

   b) When light ray obligly pass from rarer to denser, it bends towards normal

   c) (iii)

   d) (ii)

3. a) Refractive index, Snell's law.

   b) n

   c) 1.5

   d) same plane

   e) directly proportional

4. a) Refraction

   b) Yes, when light travels from water to air it deviates.

   c) Pencil appears to be bend more

5. a) 42^0

   b) Definition text book

   c) C

   d) (i) When hight tavels from denser medium to a rarer medium

      ii) When angle of incidence greater than critical angle.

   e) In medical field,

      in the field of communication

6. a) Refractive index of glass = $\dfrac{\text{Velocity of hight in a air}}{\text{Velocity of Light in glass}}$

b) Definfintion

c) $ngw = \dfrac{2 \times 10^8}{2.25 \times 10^8} = 0.88$

d) $nwg = \dfrac{2.25 \times 10^8}{2 \times 10^8} = 1.125$

7. a) Diamond , Water

b) Water, Diamond

c) $nWd = \dfrac{1.33}{2.42} = 0.54$

$\therefore \ ndw = \dfrac{1}{nwd} = \dfrac{1}{0.54} = 1.8$

8. a) No. glass rod appears completely pyrex glass rod appeas partially

b) Glass rod is visible in all medium but pyrex glass rod is visible only in water. Because refractive index of glycerin, sunflower oil, and pyrex glass road are same that's why pyrex glass rod is not visible in glycerine and sunflower oil.

9. a) Concave lens

b) Virtual

c) Concave lens cannot converge the incident rays at a point

d) No

e) Myopia (Near sighlidness)

10.
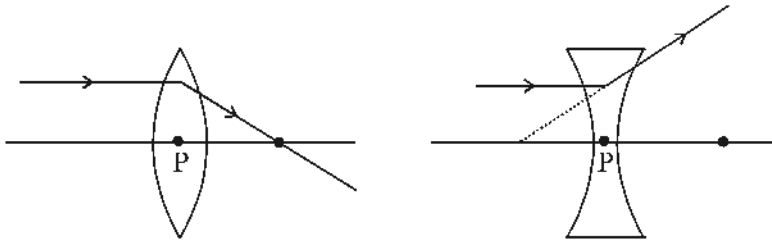
11.
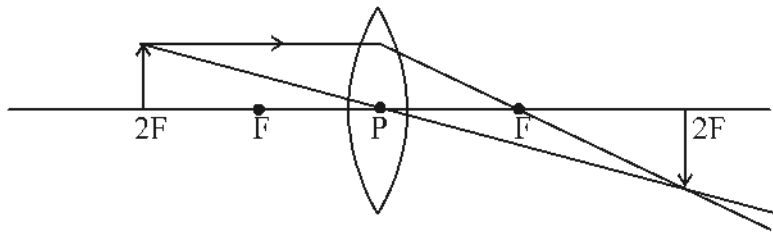
Position of image : at 2 F

Nature of image : real inverted

Size : Same as that of object

12. a) U = –25cm

b) V = + 100 cm

c) OB = + 1cm

d) IM = –4cm

e) U = –25cm

V = + 100 cm

$$f = \frac{uv}{u-v} = \frac{-25 \times 100}{-25-100} = \frac{2500}{-125} = +20cm$$

f) $m = \dfrac{v}{u} = \dfrac{100}{-25} = -4$

13. a) At F

b) Real

c) At 2F

d) Inverted

e) Real

d) Magnified

14. a) U = –20cm

V = +40cm

ho = 2cm

Magnification, $m = \dfrac{v}{u} = \dfrac{40}{-20} = -2$

$$m = \frac{hi}{ho}$$

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

$$hi = 2 \times -2 = -4cm$$

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

c) Larger than the object (Mangnified)

inverted

real

15. a) ho = + 6cm

hi = +2cm

$$m = \frac{hi}{ho} = \frac{+2}{+6} = \frac{+1}{3}$$

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

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

d) * Image is smaller than the object (dimishsed)
* Erect

16. a) The prescription indicates that the power of the lens is –2.5 D (dioptre)

b) As the power is negative, it is concave lens

c) P = –2.5D

$$P = \frac{1}{f}, \ f = \frac{1}{p} = \frac{1}{-2.5} = \frac{-100}{2.5} = -40 \text{ cm}$$

17. $f = +50 \text{ cm} = \dfrac{+50}{100} \text{ m}$

$$P = \frac{1}{f} = \frac{1}{+50/100} = \frac{+100}{50} = +2D$$

18. $ho = +2cm$

   $hi - +8cm$

   $$m = \frac{hi}{ho} = \frac{+8}{+2} = +4$$

b)   Magnification is positive

c)   m = + 4

   u = −10

   $$m = \frac{V}{u}$$

   $$+ 4 = \frac{V}{-10}$$

   $V = + 4 \times -10 = -40$ cm

   The image is 40 cm away from the lens

d)   large than the object

   erect

   virtual

19.   Since stars are at a greater distance, they appear like, a point source. Light coming from distant stars passes through different layers of atmosphere. Since each layer differs from the other in their optical densities, light undergoes successive refraction. The rays of light appear to come from different points on reaching the eye after refraction. This is the reason for twinkling of stars at night.

UNIT TEST

Max: Score: 20

Answer all questions (2×1=2)

1. The ability of medium to influence the speed of light through it is called....

2. The ratio between height of the image to the height of the object is called....

Section - B

Answer any two questions (2×2=4)

3. Check the given figure and write whether it is true or false.

a)   b)
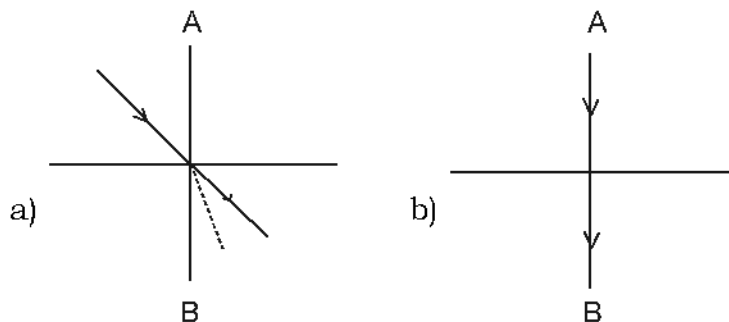
4. Calculate the power of the lens of focal length + 25cm

5. Complete the ray diagram.
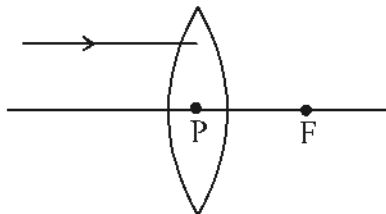
Section - C

Answer any two questions (2×3=6)

6. Nature of images formed by two cases in an experiment is given below.

   (i) erect and enlarged virtual image

   (ii) erect and diminished virtual image

   (a) Which type of lens forms the above image?

   (b) Name the lens which is used to produce an image of same size as

that   of the object. Where will be the position of object?

7. When an object is placed at a distance of 15 cm from a convex lens real, image is obtained at a distance of 30 cm from the lens. Calculate the focal length of the lens.

8. Write any three application of total internal reflection in our daily life

Section - D

Answer any two questions.   **(2 × 4 = 8)**

9. Complete the ray diagram. Mention the position and characteristics of image obtained
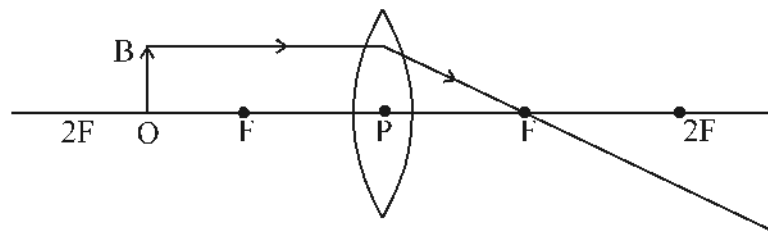
10. A convex lens of focal length 10 cm produce an image of an object at a distance of 15 cm from it.

    a) What will be the distance of object from the lens?

    b) If height of the object is 3 cm, find the height of image?

    c) Note down the characteristics of image formed

ANSWER KEY	
1. Optical denisty	1
2. Magnification	1
3. a) False	1
b) True	1

4. $f = 50 \text{ cm} = \dfrac{50}{100} \, m$ 1

$$P = \frac{1}{f} = \frac{100}{50} = D$$

5.
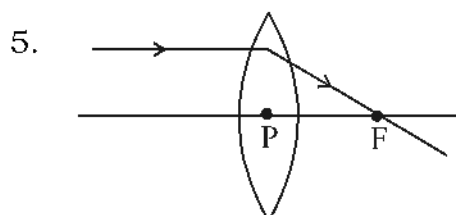
6. a) i) Convex lens
       ii) Concave lens
       b) Convex lex at 2 F

7. U = –15 cm, V = 30 cm

    $$f = \frac{uv}{u-v} = \frac{-15 \times 30}{-15-30} = \frac{-450}{-450} = 10 \text{ cm}$$

8. Endoscope   1
    Optical fiber   1
    Brilliance of diamond   1

9.
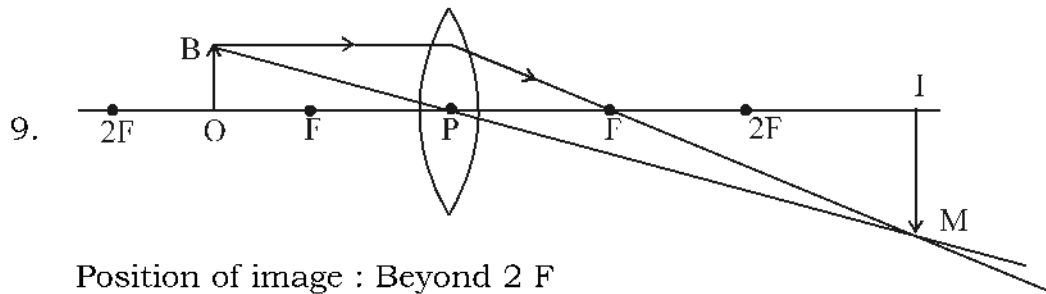
    Position of image : Beyond 2 F

    Nature of image : Inverted magnified Real

10. F = 10 cm, V = 15 cm, U?

    F = 10 cm, U = 15 cm, u = ?

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

    $$\frac{1}{u} = \frac{1}{15} - \frac{1}{10} = \frac{10-15}{150} = \frac{-5}{150} \quad u = \frac{150}{5} = -30 \text{ cm}$$ 1

    b) $m = \dfrac{v}{u} = \dfrac{15}{-30} = -\dfrac{1}{2}$, ho = 3 cm

    $$m = \frac{hi}{ho}$$

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

    2hi = 3

    hi = $\dfrac{3}{2} = 1.5$

    c) Image - Real , diminished, inverted.

Unit 6

VISION AND THE WORLD OF COLOURS

```
                        Eye and vision ─────── Power of
                   ┌──────────┼──────────┐      accommodation
                   │          │           │            │
            ┌──────────┐ ┌──────────┐          ┌────────────┐
            │Near point│ │Far point │          │            │
            └──────────┘ └──────────┘          └──────┬─────┘
                 │            │                       │
            ┌──────────┐ ┌──────────┐          ┌────────────┐
            │Long sight│ │Short sight│         │Presbyopia  │
            └──────────┘ └──────────┘          └────────────┘

                   ┌─────────────────┐
              ┌────│Dispersion of light│──────┐
              │    └─────────────────┘        │
        ┌──────────┐                  ┌────────────────────┐
        │Wave length│    ┌────────┐   │Recombination of colour│
        └──────────┘     │Rainbow │   └────────────────────┘
                         └────────┘

              ┌──────────┐
         ┌────│Scattering│──────┐
         │    └──────────┘      │
   ┌───────────────────┐  ┌────────────┐
   │Red colour of sun at sun│ │Tyndal effect│
   │  rise and sun set │    └────────────┘
   └───────────────────┘

              ┌────────────────┐
              │Light pollution │
              └────────────────┘
```
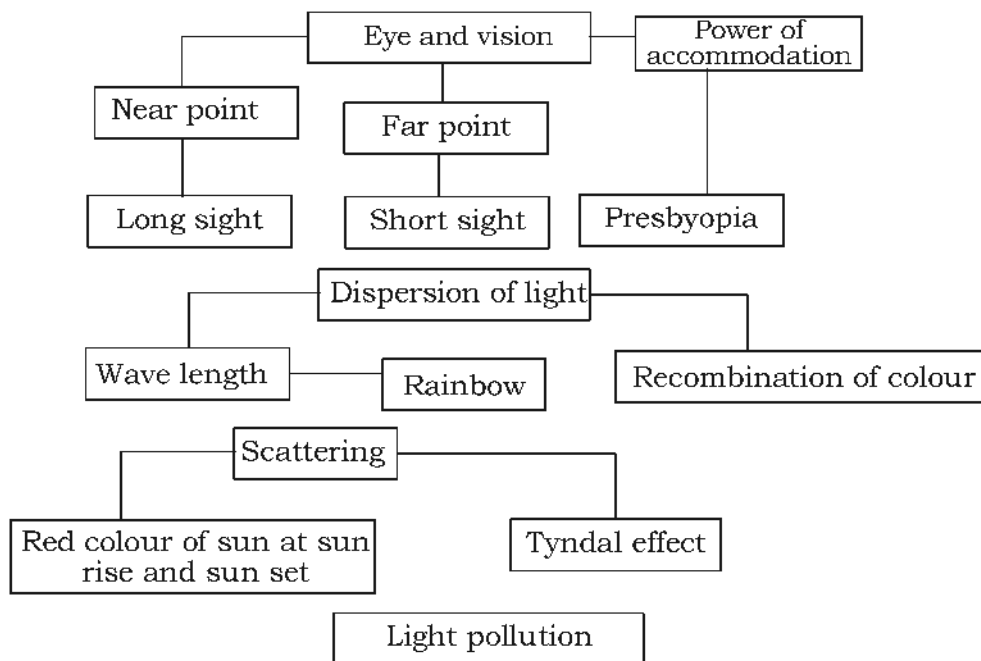
◆

Points to remember

➤ Near point is the nearest point at which the object s can be seen distinctly.

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

➤ Far point is the farthest point at which the object s can be seen distinctly. The far point of an eye with healthy vision is at infinity.

➤ The ability of the eye to form an image on the retina by adjusting the focal length of the lens , irrespective of the object, is the power of accommodation. For a person with long sightedness the size of the eye ball is smaller or power of the eye lens is low

➤ Long sightedness can be corrected by using convex lens of suitable focal length.

➤ For a person with short sightedness size of the eye ball is larger or the power of the eye lens is high.

➤ Short sightedness can be rectified by using concave lens of suitable focal length.

➤ When sunlight is passed through a glass prism spectrum VIBGYOR is obtained.

➤ Sunlight is composite light.

➤ Red colour is seen at the upper edge of the rainbow.

➤ Violet colour is seen at the lower edge of the rainbow.

➤ When an object is viewed by a person, its image remains in the retina of the eye for a time interval of 1/16 second after seeing it. This phenomenon is called Persistence of vision.

➤ Scattering is the change in direction brought out by the irregular and partial reflection of light when it hits the particles of the medium.

➤ As the size of the particle increases, the rate of scattering also increases.

➤ If the size of the particle is greater than the wavelength of light , then the scattering is same for all colours.

ACTIVITY

1. Observe the diagrams

Fig.1

Laser rays

Slit   Glass prism   Screen

Fig.2

White light

Slit   Glass prism   Screen

B
A

PHYSICS
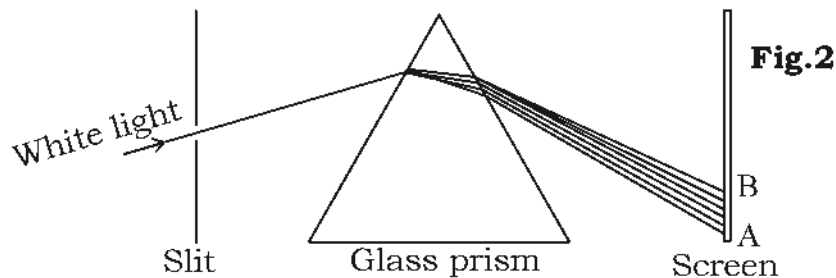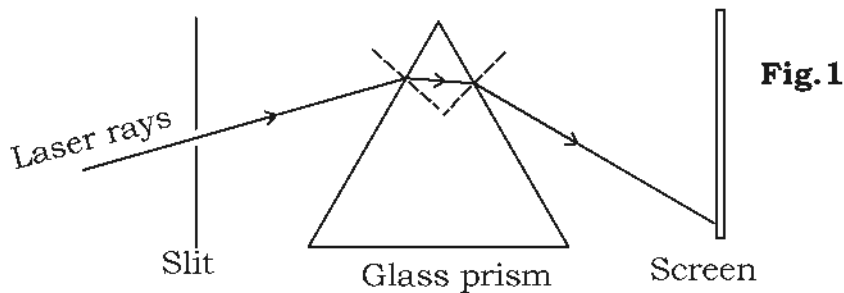
a. Write the inference of both the diagrams

b. Name the phenomenon behind this.

c. In fig. 2, write the names of colours from A to B?

d. What is the name given to this type of distribution of colour.

e. Which colour is more deviated?

f. Which colour is less deviated?

g. What is the reason behind the difference in devidation for each colour?

2. The diagram of white light falling on water drop is given
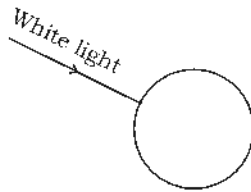
a. Complete the diagram

b. What changes occur for the incident ray ?

c. Name the natural sight based on this phenomenon ?

d. In which shape can you observe this ?

e. Which is the colour that can be observed in the outer edge?

f. Which is the colour that can be observed in the inner edge?

3. Sunlight reflects on the dust particles and air molecules present in earth's atmosphere.

a. This phenomenon is known as ....

b. Write the practical definition of this phenomenon.

c. Explain the colour of the sky related to this phenomenon ?

d. Can this phenomenon occur on the moon? Why ?

e. What is the colour of the sky on moon?

f. What is the colour of the sun during setting and rising times? Why?

g. Which colour is used in signal lights? Why?

4. On a foggy morning the path of sunlight is visible clearly.

a. What is the name of this phenomenon?

b. Write the definition of this.

c. What is the main factor influencing the intensity of this phenomenon?

5. Image formation in the eye is depicted below
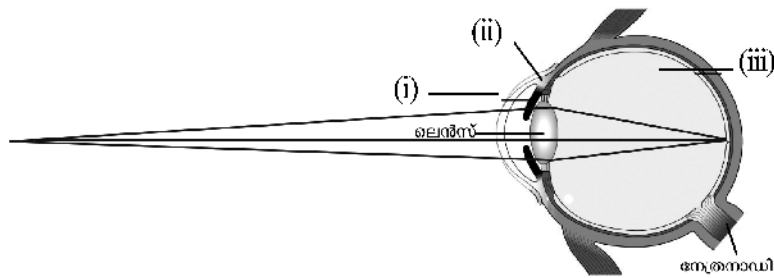
a) Identify the parts (i), (ii) & (iii) and fill in the blanks.

b) What is the name of the nearest point at which the object can be seen distinctly?

c) What is the least distance of distinct vision for a healthy eye?

d) What is the farthest point at which objects can be seen clearly?

e) What is the longest distance for healthy vision of an eye?

f) What is the relation between curvature and focal length of a lens.

g) Name the part of the eye which helps to vary the curvature of the eye lens.

h) What is power of accommodation

6. International dark sky association deals with the task of reducing light pollution (Photo Pollution)

a) What is light pollution

b) Write any four consequences of light pollution

c) Write down the ways to decrease light pollution

7. The figure showing the image formation in the eyes of a person is given below
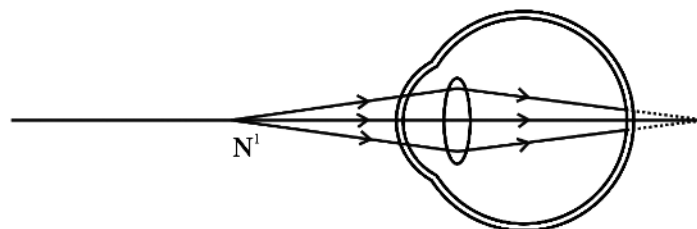
Observe the figure and answer the following questions.

a) In the above figure where is the image formed?

b) Name this defect of eye.

c) What is the reason for this defect?

d) How can we rectify this defect?

8. The figures shows the image formation in the eyes of person with near sightedness
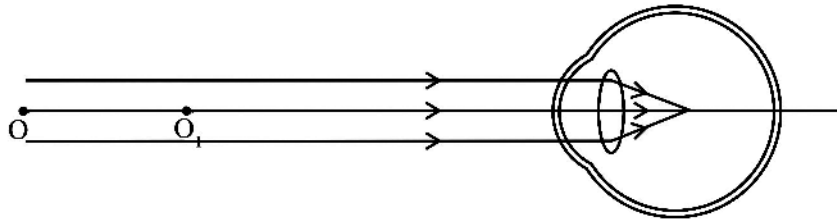
Observe the fig and answer the following question

a) In the above fig where is the image formed?

b) What is the reason for near sightedness?

c) Name the lens which is used to rectify near sightedness.

d) Draw the figure that explains how near-sightedness is rectified by using lens.

9. In his prescription an eye specialist wrote the following figures.

+2D , - 2 .5 D

a) What are the type of lens indicated in this prescription

b) Which of the above lens is suitable for a person suffering from presbyopia

c) What is the reason for presbyopia

Answer Key

1. a. Fig.1 - Deflection of the path of reflected ray.

Fig : 2 - Deviated light rays are split up into component colours.

b. refraction, dispersion

c. VIBGYOR

d. Colour spectrum

e. Violet

f.   Red

g.   Difference in wavelength

2.   a.   Completion of diagram

     b.   Dispersion, refraction, internal reflection

     c.   Rainbow

     d.   Shape of arch (bow) when seen from an aeroplane - it is in circle shape.

     e.   Red

     f.   Violet

3.   a.   Scattering

     b.   Correct definition

     c.   Proper explanation

     d.   No. Absence of atmosphere / No scattering

     e.   dark

     f.   red

     g.   Red. Getting attention from long distance because of less scattering, comparatively to other colours

4.   a.   Tyndal effect

     b.   definition of tyndal effect

     c.   Size of the particles passed through the object.

5.   (a) (i) Iris

        (ii) Ciliary muscle

        (iii) Retina

     b)   Near point

     c)   25cm

     d)   far point

     e)   Infinity

     f)   Inversly proportional

     g)   Ciliary muscle

     h)   Definition of power of accomodation

6.   a)   The use of light in excess in a non- judicious manner is referred to as light pollution

b) 1) Life cycle of living beings

2) Diminshed sky vision

3) Misleading of migrating birds

4) High beam of head light causes hindrance to others

c) 1) Use shades to light sources

2) Control the use of light duing night

3) Use head light in dim mod.

7. a) Behind the retina

b) Long sightedness

c) Small size of the eyeball, low power of the eye lens.

d) By using convex lens of suitable focal length

8. a) In front of the retina

b) Large size of the eyeball, high power of the eye lens

c) By using concave lens of suitable focal length

d)
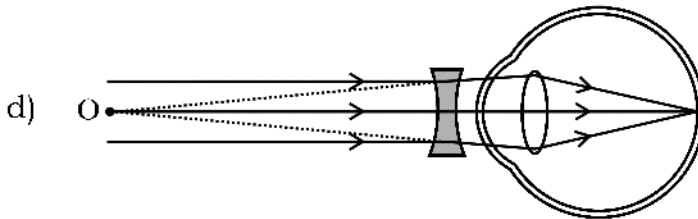
9. a) Convex, Concave

b) Convex

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

Unit Test

Score : 20   Time : 45 mts.

Section – A

Answer all question.   (2×1=2)

1. The nearest point at which an object can be clearly seen is called
    ....

2. The lens used to rectify short sight is ....

Section – B

Answer the two question.   (2×2=4)

3. A torch is rotated rapidly appears as an illuminated circle.

    a) The above effect is due to which property of eyes?

    (b) Explain this phenomena

4. To get clear vision, the images of near object and distant object should
    fall on the retina of the eye.

    a) Name the ability of eyes to get an image on the retina

    b) How does eyes adjust itself to get the image of distant object on
        the retina?

5. An ophthamolagist gave prescription to this patient to buy spectacles.
    It is written as +1.25 and -1.5D.

    a)   What has the doctor indicated in the prescription

    b)   What are the type of lenses prescribed above?

Section - B

Answer any two question.   (2×3=6)

6. Dispersion of light when it passes through a water drop in the
    atmosphere is shown.
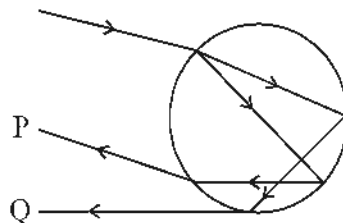
    a) Name the phenomena which takes place within the raindrops

    b) Name the colours P and Q.

(c) Write the position of these colours in a rainbow.

7. Even though light propagates in a straight line, we have light inside the house and inside the classroom due to scattering .

Explain an experiment that can be conducted in the classroom to describe scattering of light.

8. The path of a laser light through a glass prism is depicted.
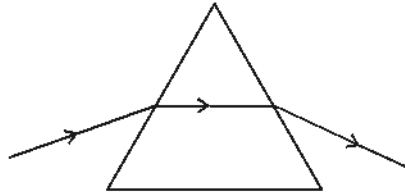
a) What will happen if sunlight is allowed to pass through prism?

b) Give reason.

Section –D

Answer all questions.   **(2×4=8)**

9. The image of distant object formed on the retina of eye is depicted.
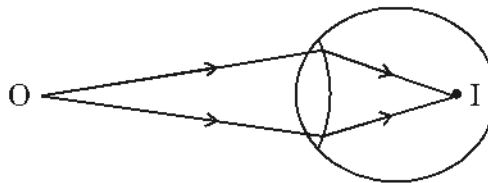
a) What is this defect of the eye?

b) Name the reason for the above defect

c) How can we rectify this defect of the eye?

10. a) During sunrise and sunset , sun appears red why?

b) Why do we use red light for signals.

Answer Key

1.	Near point
2.	Concave lens
3.	a) Persistence of vision
	b) Explain persistance of vision
4.	a) Power of accommodation
	b) Explain the correct arrangement of experiment.
5.	a) Power of lens used in the spectacle
	b) + 1.25D ⟶ Convex lens
	−1.5D ⟶ Concave lens
6.	a) Refraction , Total internal reflection
	b) P – Violet
	Q – Red
	c) Upper edge – Red
	Lower edge – Violet
7.	For correct answer
8.	a) Dispersion
	b) Change in wavelength
9.	a) Near sightedness
	b) Eye ball is large.
	c) By using concave lens
10.	a) for correct answer
	b) For red colour wavelength is high so less scattering occurs

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Unit
7

ENERGY MANAGEMENT

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                        ┌──────────┐
                        │  FUELS   │
                        └──────────┘
          ┌──────────────────┼──────────────────┐
    ┌───────────┐      ┌──────────────┐    ┌──────────────┐
    │ Renewable │      │ Non Renewable│    │ Nuclear fuels│
    └───────────┘      └──────────────┘    └──────────────┘
   ┌──────┬──────┬──────┐       │          ┌──────┴──────┐
┌────────┐┌──────┐┌────────┐ ┌────────────┐ ┌─────────┐┌─────────┐
│ Energy ││Bio – ││ Solar  │ │Fossil fuels│ │ Fission ││ Fusion  │
│ from   ││Mass  ││ Energy │ └────────────┘ └─────────┘└─────────┘
│ wind   ││      ││        │
└────────┘└──────┘└────────┘
              ┌────────┐   ┌────────┐
              │ Green  │───│ Brown  │
              │ Energy │   │ Energy │
              └────────┘   └────────┘
                   │           │
                   ┌───────────┐
                   │  Energy   │
                   │  Crisis   │
                   └───────────┘
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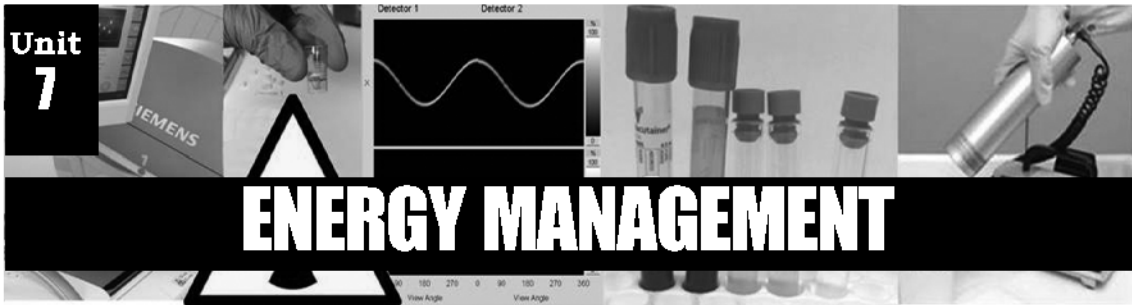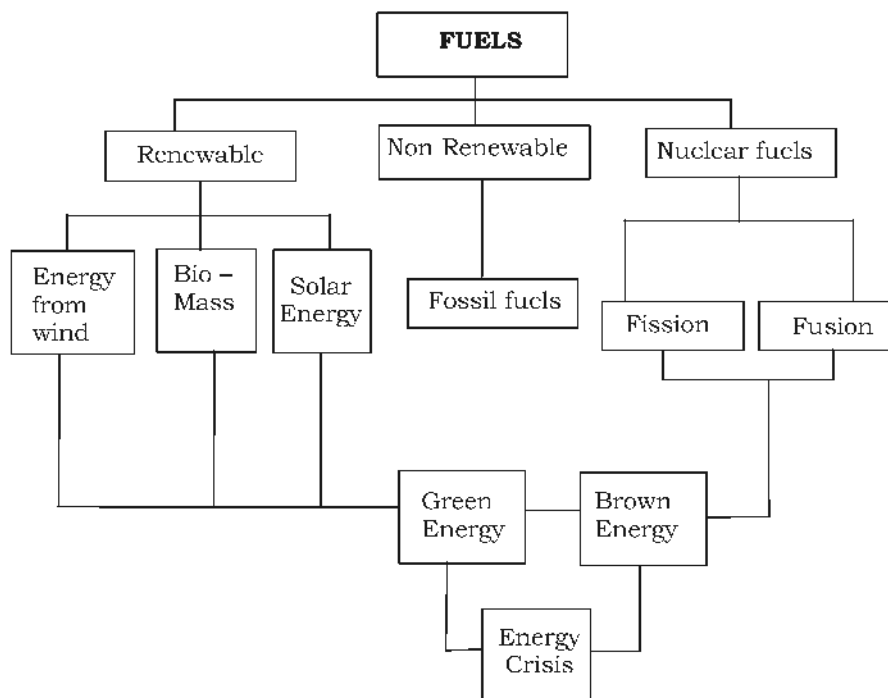
Points to Remember

- Combustion → Complete combustion ; Partial Combustion.
- Fuel → Renewable and Non renewable.
- Fossil Fuels → Petroleum, Coal
- Efficiency of fuels → Calorific value
- Biomass → Biogas
- Solar Energy → Solar Cell, Solar Panel, Solar Devices
- Solar Thermal Power plant
- Energy from wind, enegery from sea, Geothermal energy.
- Nuclear Energy → Nuclear Fission, Nuclear Fusion.
- Green Energy, Brown Energy
- Energy Crisis, Remedies

ACTIVITY

Find out correct relation and fill up the blanks.

1.   Coal :   Distillation ;   Petroleum : ....

2.   LPG :   Butane   ;   CNG   : ....

3.   Find out the odd one

 a.   Coal, Petroleum, Natural gas, Biogas

 b.   Petrol, Kerosene, Ammonia, Naphtha

 c.   Diesel, Windmill, Nuclear fuel, Petrol.

 d.   Peat, Coke, Lignite, Bituminous coal.

 e.   Firewood, Coal, Cow dung cake, Hay

4.   Write the expansion of the following

 a) CNG   b) LNG   c) LPG

5.   Coal is classified into four based on the carbon content in it. Fill in the blanks suitably.

 Peat, ... , ... ,   Bituminous coal.

6.   a) Name the compressed liquefied fuel used for household purpose?

 b) Domestic LPG produces an odour when it is mixed with air. Write the reason for this odour?

7,   a) Hydrogen is not used as a household fuel though it has high calorific value. Write the reasons?

 b) Write down the situations where Hydrogen is used as a fuel?

8.   a) Which are the devices that utilise solar energy?

 b) Write down the situations when plants utilise solar energy?

9.   a) Write down two favourable conditions for complete combustion?

 b) What are the drawbacks of partial combustion?

10. a) Why pollution test is necessary for vehicles?

 b) In major cities like Delhi, it is insisted to use CNG as fuel in vehicles. Why?

11. Among Biomass and Biogas, which is more suitable as a fuel? Justify your answer?

12. Classify the following sources as Green Energy and Brown Energy.

    (Solar cell, Atomic Reactor, Tidal Energy, Hydro Electric Power, Diesel Engine, Windmill, Thermal Power Station.)

13. a) What is Energy crisis?

    b) Write down the reasons for Energy crisis?

    c) Write down the remedies for Energy crisis?

14. It is marked as B 20 on the top of a LPG cylinder. What is the significance of such a marking ?

15. What safety measures will be taken, if you noticed LPG leakage?

16. 'BLEVE' is a term related with LPG leakage. What is meant by this?

17. "Ocean is a great source of energy" How does Ocean thermal Energy conversion plants work?

18. What is mean by hot spot?

19. Is it possible to establish geothermal plants in Kerala. Substantiate your answer

20. Earth is polluted in different ways. One of them is nuclear pollution. What is meant by nuclear pollution?

21. Name the particles responsible for nuclear pollution

22. Classify the following as natural nuclear hazards and artificial nuclear hazards.

    ● Different radiations from sunlight

    ● Wastes from nuclear reactors

    ● The use of radioactive isotopes in the medical field

    ● Radiations from radioactive materials on the earth

ANSWER KEY

1. Fractional distillation.

2. Methane.

3. a. Biogas

   b. Ammonia

   c. Windmill

d. Coke

e. Coal

4. CNG   : Compressed Natural Gas

    LNG   : Liquefied Natural Gas

    LPG   : Liquefied Petroleum Gas

5. Lignite, Anthracite

6. a) LPG

    b) By mixing the chemical substance Ethyl mercaptan

7. a) High rate of combustion, Explosive nature, Difficult to store.

    b) Hydrogen fuel cell , Used in rockets

8. a) Solar Water Heater, Solar Cooker, Solar Lamp

    b) Photosynthesis

9. a) Sufficient Oxygen supply, Dry (If solid fuel)

    b) Carbon monoxide, Sooth, More smoke, Atmospheric pollution.

10. a) Pollution test is made compulsory to check whether the components in the smoke from the vehicles are in the permitted range.

    b) The fuel efficiency of CNG is more, low atmospheric pollution.

11. Biogas, using Biomass as fuel causes atmospheric pollution, low fuel efficiency.

When biomass is converted to biogas, it not only obtains a fuel with greater calorific value but also minimises the atmospheric pollution. The slurry discharged from the biogas plant is a good manure also.

12

Green Energy	Brown Energy
Solar Cell	Atomic Reactor
Tidal Energy	Diesel Engine
Hydroelectric Power	Thermal Power plant
Windmill	

13. a) Definition

    b) Population Explosion, Industrialisation, Urbanisation, Increased use of vehicles, Increased energy consumption in industries etc.

    c) Use Renewable sources of energy, Ensure maximum efficiency

of machines and vehicles, Judicious utilisation of energy, Timely maintenance of machines.

14. The expiry date of the cylinder is from April to June 2020

15. ● Disconnect electricity from outside the house.

● Switch off the regulator and shift the cylinder to an empty space.

● Keep the windows and doors open.

● Cover the nose and mouth with soft cloth to avoid the intake of smoke and gases.

● Request help from the fire force by calling in the toll free number

16. If there is a fire due to leakage of LPG, the cylinder will get heated due the excess heat. As a result the liquid LPG becomes gas and thus increasing the pressure inside. The ability to expand is 250 times for the gaseous LPG. Therefore when LPG becomes gas, the container cannot accommodate the entire gas and pressure inside the cylinder increase to a very high level. This causes a huge explosion, which is known as BLEVE

17. The temperature at the surface of ocean is relatively greater than the temperature at the deep levels. Ocean thermal Energy conversion plants produce energy making use of this difference in temperature. The heat at the surface boils volatile liquid like ammonia using the gas the turbine is rotated. The cold water at the bottom liquefies the gas again.

18. The interior of the earth is in molten form. The mangma which is at higher temperature comes out of the core through the softer regions. Such places are known as hot spots.

19. No. Geothermal plants cannot be establish in Kerala. This is because there is no hot spot found in Kerala.

20. The Pollution caused by the presence of radioactive substances and radiations in water, air and environment is known as nuclear pollution

21. Alpha particles, Beta particles and gamma radiations.

22.

Natural Nuclear Hazard	Artificial Nuclear Hazards
Different radiation in sunlight	Wastes from nuclar reactor
Radiations from radio active materalls on the earth	The use of radioactive isotopes in the medical field

Unit Test 1

Class : 10   Time: 40 Mts.

Answer the following questions.

1. Which is not a fossil fuel among the following?

    (a) Coal   (b) Petroleum   (c) Hydrogen   (d) Natural gas

2. Choose the advantages of Hydrogen as a fuel from the following

    (a) Low Density   (b) Low Calorific Value

    (c) Availability   (d) High Calorific Value

Answer any two questions from 3 to 5

3. Match the following

    Solar Energy   Methane

    Petroleum   Slurry

    Biogas   Nuclear Fusion

    LNG   Nuclear Fission

                Fractional Distillation

4. We can produce electricity from Windmill

    (a) What is the energy conversion in Windmill?

    (b) Write the measures to be taken while installing Windmill

5. It is better to establish Biogas plants in order to satisfy the theme "Waste disposal at the origin itself"

    (a) Do you agree with this statement? Justify your answer.

    (b) Suggest another method for waste disposal.

Answer any two questions from 6 to 8

6. a) What are the different methods by which energy is produced from the nucleus ?

    b) Write in brief the working of a Nuclear power station

7. The Calorific value of LPG is 55000 kJ/kg

    (a) What is the meaning of this statement ?

    (b) Name the process to obtain LPG from petroleum ?

    (c) What are the disadvantages of using cow dung cake as a fuel ?

8. Maximum utilisation of solar energy is essential during this period

    (a) Name the electronic component in a solar cell ?

    (b) Write the energy transformation in a Solar cell ?

    (c) From where do the artificial satellites get electricity ?

Answer the following questions

9. (a) Prepare two posters on the topic "Solar Energy for the Future".

    (b) Write any two consequences of Non judicial utilisation of energy ?

    (c) Which are the conventional sources of energy ?

10, (a) Suggest method for maximum utilisation of Green Energy during the construction of new house ?

    (b) Write the role of Brown Energy in Global Warming ?

ANSWER KEY

1. Hydrogen

2. High Calorific value.

3. Solar Energy -   Nuclear Fusion

    Petroleum   -   Fractional Distillation

    Biogas   -   Slurry

    LNG   -   Methane

4. a) Mechanical Energy to Electrical Energy

    b) Availability of wind through out the year

5. a) Throwing waste indiscreetly on the way side of houses causes environmental problems. By installing Community Biogas plant we can solve this, and the production of biogas can be increased.

    b) Pipe Compost

6. a) Nuclear fission , Nuclear fusion

    b) Water is converted to steam at high temperature and pressure using nuclear energy. The force of steam is used to turn the turbines to generate electrical energy.

7. a) 55000 kJ of heat is liberated by the complete combustion of 1 kg of LPG.
   b) Fractional Distillation
   c) During the combustion of cow dung cake smoke, foul smell, carbon monoxide etc are produced and causes respiratory diseases.

8. a) P N Junction Diode
   b) Solar energy to Electrical energy
   c) From the solar panel.

9. a) Suitable Posters
   b) Decrease in the availability of Non Renewable source of energy which causes the energy crisis.
   c) Coal, Petrol, Diesel, Biomass

10. a) While constructing house make sure that sufficient sunlight is available in the rooms during day time.
    Make sure the availability of heat, cooling with wind without using electricity.
    Plant trees
    Use Solar panels, Solar water heater etc
    b) The energy produced from non renewable sources are named as Brown Energy. Combustion of these sources causes Global Warming.

Unit Test 2

Class : 10   **Time: 40 Mts.**

Answer all questions.   **(2×1=2)**

1. Find the relation in the first word pair and fill the second pair

   Coal : Distillation ; Petroleum : _____

2. Find the odd one

   (Coal, Petroleum, Natural gas, Biogas)

Answer any two questions.   **(2×2=4)**

3. Hydrogen is not used as cooking gas even though it has high calorific value. Give reason.

4. Among biogas and biomass, which is a good fact justify your answer.

5. Energy can be produced from wind.

   a) What is the energy conversion in wind mills?

   b) What are the things to be considered while establishing a windmill?

Answer any two questions. (2×3=6)

6. Write the advantage and disadvantages of solar cooker
7. Why is it said that geothermal power plants are not possible in Kerala
8. In metropolitan cities like Delhil CNG is used as fuels in Vehicles Why?

Answer all questions. (2×4=8)

9. By splitting nuclei energy is liberated.
   a) How is large amount of energy produced in an atom bomb explosion?
   b) How is energy produced in the sun and stars?
10. a) What are the factors to be considered for the maximum utilisation of green energy while constructing a house?
    b) What is meant by energy crisis?

ANSWER KEY

1. Fractional distillation
2. Biogas
3. Right answer
4. Biogas
   Correct explanation
5. A) ME – EE
   c) Correct answer
6. Correct answer
7. Correct answer
8. Answer in relation with pollution
9. a) Uncontrolled nuclear fission
   b) Nuclear fusion
10. a) Correct answer
    b) Increasing demand of energy and decreasing availability