MATRIX OLYMPIAD

The Most Innovative Talent Recognition Exam

PHYSICS

Class - VI

MATRIX

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Few words for the Readers

Dear Reader,

"*Matrix Olympiad is established to encourage school students to go a step further than their regular studies, and get a chance and exposure to competition on a wide scale. It also helps students enhance their learning of basic cognitive skills and deeper knowledge of subjects like Science, Mathematics, English, Mental Ability, Social Studies.“Matrix Olympiad helps students nurture their minds for higher targets of tomorrow and enables them to study School for JEE, NEET, CLAT, NDA, Olympiads , NSEJS, NTSE , STSE etc.*"

The above thought has been our guiding principle while designing and collating the study material for **Matrix Olympiad** . And hence, we hope that this particular material will be helpful towards your preparation for **Matrix Olympiad**.

Our team at **MATRIX** has put in their best efforts for making this particular module interesting and relevant for you. Additional efforts have been made to ensure that the content is easy to understand and error free to the extent possible. However, there might remain some inadvertent errors in answer keys and theoretical portion and we would welcome your valuable feedback regarding the same.
If there are any suggestions for corrections, please write to us at **smd@matrixacademy.co.in** and we would be highly grateful.

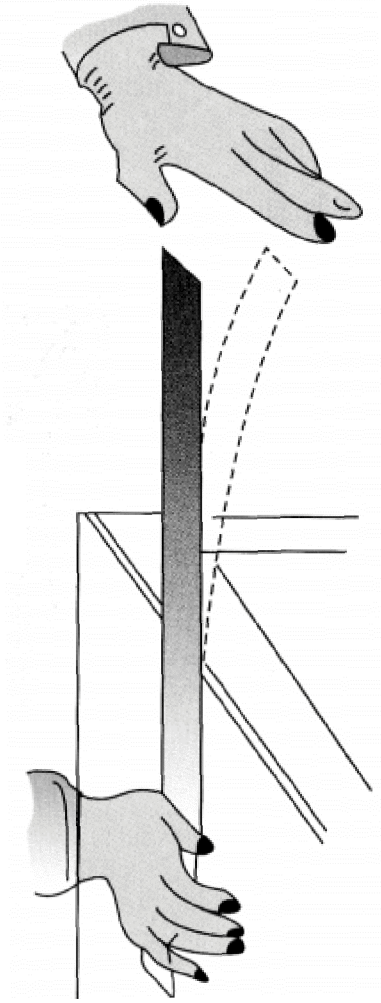
Finally, we would like to end this message by a famous quote by Ernest Hemingway - "*There is no friend as loyal as a book*." So, please give your study material the time and attention it deserves, and it will surely help you reach newer heights in your fight with competition examinations.

With love and best wishes !
Team MATRIX

CONTENTS

MOTION AND MEASUREMENT OF DISTANCES

1



INTRODUCTION

In daily life, the importance of measurement is well known. When we have to bring fruits, vegetables etc. from the market then the seller measures their quantity using beam balance and we have to pay him accordingly. The tailor needs exact measurement of our body to stitch our dresses. We always have an approximation that how much time will be spent on a journey for our convenience. Thus we can conclude that measurement is an essential part of everyday life.

1. WHAT IS MEASUREMENT ?

Measurement is the comparison of an unknown quantity with a known standard quantity of same kind. Another important thing is to identify a quantity that can be measured (known as physical quantity). Generally most of the measurements are based on physical quantities like length, mass, time, temperature etc.

2. IMPORTANCE OF MEASUREMENT

Measurement plays a vital role in our lives. It is essential for maintaining accuracy in our day-to-day life.

Ex.
- For buying milk.
- For buying rice, sugar, etc. from a grocery shop
- For getting a dress stitched at a tailoring shop.
- For checking a patient's body temperature.
- For finding out the speed of a vehicle.
- For checking the speed of an object falling on the ground.

Figure : A clinical thermometer ; used to measure human body temperature

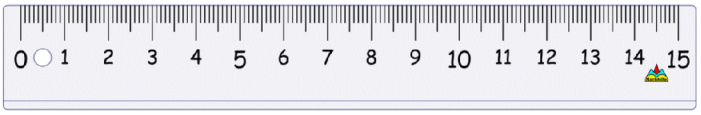


Figure : A ruler ; used to measure distances

Figure : Graduated cylinder ; used to measure volume of liquids

Figure : A vernier scale ; used to measure external and internal diameters of an object

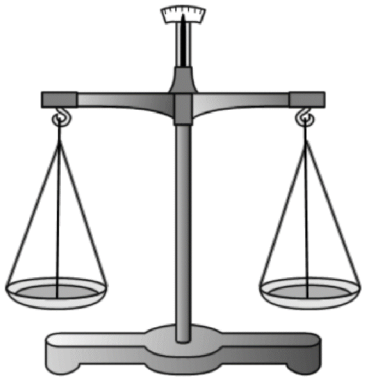


Figure : A beam balance ; used to measure mass

Figure : A measuring jar ; used to measure oils / kerosene

3. WHAT IS PHYSICAL QUANTITY AND ITS TYPES ?

Generally, we come across many quantities in our daily lives, such as length, height, time, mass, faith hope, affection, etc. Among these,only a few can be measured. For example, mass as 2 kg, length as 5 m and time as 3 seconds and so on. But quantities, such as faith, hope or affection cannot be expressed in numbers but can be expressed only as more or less. Only those quantities which can be measured physically are called physical quantities.

Types of physical quantities

Fundamental physical quantities	Derived physical quantities
Quantities which do not depend on other physical quantities are called fundamental quantities.	Quantities which depend on other physical quantities are called derived quantities.
Explanation : To measure time we do not involve mass or any other fundamental quantity, so time is a fundamental physical quantity.	*Explanation :* To measure the area of a rectangle we use its length and breadth. Area of a rectangle = Length × Breadth. Therefore, area is a derived quantity.
Examples : Mass, length, time, temperature, etc.	*Examples* : Area, volume, speed etc.

4. UNITS AND TYPES OF UNITS

A fixed quantity is called unit which does not change with time, temperature and place and is accepted by people all over the world.

Types of Units

Fundamental units	Derived units
Unit used to measure fundamental physical quantities	Units used to measure derived physical quantities.
Explanation : To measure time, we use seconds but units, such as kilograms or metres are not involved. So, second is a fundamental unit.	*Explanation* : To measure the speed of a vehicle, we involved unit of distance, i.e., metres and unit of time, i.e., seconds. Therefore, metre per second is a derived unit.
Examples : metre, kilogram, second, kelvin etc.	*Examples* : density kilogram per cubic metre, speed - metre per second etc.

5. SYSTEM OF UNITS

The fundamental unit of length, mass and time taken together from a system of units. For measuring various physical quantities following systems are commonly adopted.

Name of the system	Unit		
	Length	Mass	Time
1. FPS	foot	pound	second
2. CGS	centimeter	gram	second
3. MKS	metre	kilogram	second

6. STANDARD UNITS OF MEASUREMENTS

In measuring a physical quantity one needs to have an ideal of its various units, their interrelationship and also the various devices used for its measurement.

The unit plays an important role in the description of a physical quantity. But the unit used for a particular physical quantity is person dependent. Hence, they need to be specified and standardized to maintain uniformly. Under this treaty, an International Bureau of weights and measures was established. This Bureau situated at Sevres in Paris has specified standard units, measured more accurately with advanced techniques of science.

6.1 CHARACTERISTICS OF STANDARD UNIT

(a) It should be of convenient size.

(b) It should not change with respect to space and time.

(c) It should be possible to define, without any doubt or ambiguity.

(d) It should not be perishable.

(e) It should be easily reproduced.

6.2 FUNDAMENTAL UNITS OF SI SYSTEM

All the physical quantities in Physics can be expressed in terms of seven fundamental quantities.

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Luminous intensity	candela	Cd
Amount of substance	mole	Mole

6.3 RULES FOR WRITING SI UNITS

Rule: 1

The symbols used for units are always written in lowercase.

S. No.	Quantity	Unit	
		√	×
(i)	Mass	kg	Kg
(ii)	Length	m	M
(iii)	Time	s	S

Rule: 2

Name of the unit should start with lowercase letter even if it is named after scientists.

S. No.	Quantity	Unit	
		√	×
(i)	Temperature	kelvin	Kelvin
(ii)	Force	newton	Newton
(iii)	Temperature	celsius	Celsius
(iv)	Length	metre	Metre

Rule: 3

Symbol of unit named after a scientist, should start with an uppercase letter.

S. No.	Quantity	Unit	
		√	×
(i)	Temperature	°F	°f
(ii)	Electric current	A	a
(iii)	Force	N	n

Rule: 4

Symbol of units should not be followed by full stop.

S. No.	Quantity	Unit	
		√	×
(i)	Length	m	m.
(ii)	Time	s	s.
(iii)	Density	kg/m³	kg/m³.

Full stop can be used after a unit only when it is written at the end of sentence.

Rule: 5

The symbols for units are never written in plural, but when written in unit name, then plurals can be used.

S. No.	Quantity	Unit	
		√	×
(i)	Length	3 m, 3 metres	3 ms
(ii)	Time	2s, 2 seconds	2 ss
(iii)	Mass	20 kg, 20 kilograms	20 kgs
(iv)	Force	3 newtons, 3 N	3 NS

Rule: 6

Negative powers are used for the units in the denominator of a compound unit.

S. No.	Quantity	Unit	
		√	×
(i)	Density	$kg\ m^{-3}$	$(kg\ m)^{-3}$
(ii)	Speed	$m\ s^{-1}$	$(m\ s)^{-1}$

Rule: 7

Space should be left between the value and unit, and also between two units of a compound unit.

S. No.	Quantity	Unit	
		√	×
(i)	Temperature	273 K	273K
(ii)	Current	5 A	5A
(iii)	Density	$5\ kg\ m^{-3}$	$5kgm^{-3}$

Rule: 8

Space should be maintained between the value or number and the multiple or submultiple used and no spaces should be given between multiple or submultiple and unit.

S. No.	Quantity	Unit	
		√	×
(i)	Length	15 mm	15 m m
(ii)	Density	$10\ kg\ m^{-3}$	$10\ k\ gcm^{-3}$

6.4 MULTIPLE UNITS AND SUBMULTIPLE UNITS

Multiple Units : which are used to measure large quantities are called multiple units.

Example : Distance between two cities, i.e., from Jaipur to Sikar is 1,80,000 metres.

Distance = 1,20,000 m = 120×10^3 m = 120 km

Large distance such as distance between planets are measured in light years.
1 light year = 9.46053×10^{12} km

NOTE : Kilo is a multiple unit of gram

Submultiple Units : which are used to measure smaller quantities are called submultiple units.

6.5 LIST OF FEW PREFIXES USED IN SI SYSTEM

Prefix	Abbreviation	Multiples
Deca	da	10^1
Kilo	k (lowercase)	$1000 = 10^3$
Mega	M	$1000000 = 10^6$
Giga	G	$1000000000 = 10^9$
Tera	T	$1000000000000 = 10^{12}$

Prefix	Abbreviation	Multiples
Deci	d	$\frac{1}{10} = 10^{-1}$
Centi	c	$\frac{1}{100} = 10^{-2}$
Milli	m	$\frac{1}{1000} = 10^{-3}$
Micro	μ	$\frac{1}{1000000} = 10^{-6}$
Nano	n	$\frac{1}{1000000000} = 10^{-9}$
Pico	p	$\frac{1}{1000000000000} = 10^{-12}$

7. LETS UNDERSTAND SOME MEASUREMENT

7.1 MEASUREMENT OF LENGTH

Length, a fundamental quantity, is used to measure the distance between two points in space. The SI unit of length is metre (m) and its C.G.S. unit is centimetre (cm).

7.2 WAYS TO MEASURE LENGTH

Ruler

- The smallest measurement that can be measured using a ruler is 1 mm.
- To measure the length of a match box, place the match box near the ruler.
- See that one end of the box is at the zero reading of the ruler as shown in the figure, then the scale at the other end is the length of the box (i.e. 2 cm)

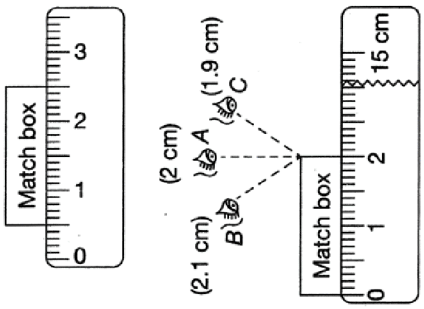


Figure : Measurement of length using ruler

Precautions :

(i) Reading should always be noted correctly by observing from position 'A', i.e., exactly above.

(ii) The reading are observed in a slanted position 'B' (i.e., 2.1 cm) and 'C' (i.e., 1.9 cm) This error in measurement is called parallax error.

(iii) If the edges of the ruler are worn out, then place the box at any other position near the ruler and subtract reading at the starting end (i.e. 1 cm) of box from the final end (i.e. 2.5 cm) of the box to measure the length of the box (i.e. 2.5 – 1.5 = 1 cm)

Divider

A divider is used to measure the distance between two points. The correct use of a divider can give a fairly accurate measurement. The divider is placed such that its two points are at the two ends of the length to be measured. Then, without disturbing the divider, the distance between the two points is measured with a ruler

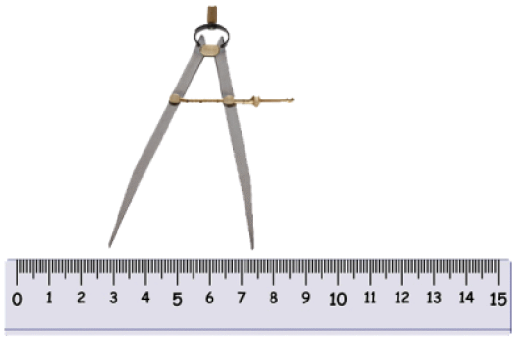


Figure : Measurement of a length using divider

Thred and Scale

- To measure curved lengths, spread the thread on a curved surface and mark the initial and final points.

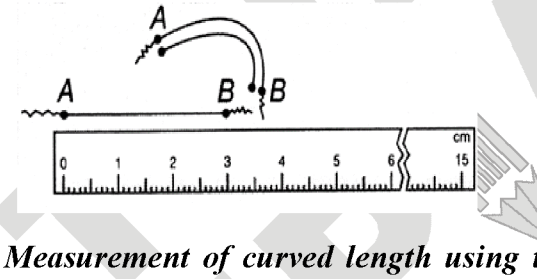


Figure : Measurement of curved length using thread

Now spread the same thread on the scale such that the intial point is at zero of the scale as shown in the figure and note the measurement.

7.3 MEASUREMENT OF AREA

Area, a drived quantity, is used to measure surface, the SI unit of area is square metre (m^2) and its CGS unit is square centimetre (cm^2)

Example : In a study room, the study table occupies some surface depending on its size

1. Multiple units used to measure area are hectare and square kilometre.

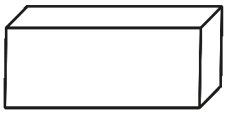
1 hectare = 100 m × 100 m = 10^4 m^2

1 km^2 = 1 km × 1 km = 1000 m × 1000 m = 10^6 m^2

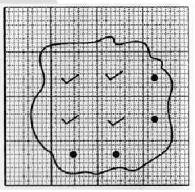
2. Submultiple unit used to measure area is square centimetre.

Methods of measuring area

Regular surfaces → Applying formulas → Explanation : Area of a room = 4m×3m (In rectangle shape) = 12 m^2



Irregular surfaces → Graph method → Example : Spread an irregularly shaped object on a graph paper and draw the outline. Remove the object and count the number of squares in the outline.



Number of complete squares = 4

Number of incompete squares more than half = 4

Therefore, approximate area of object = 4 + 4 = 8cm^2

7.4 MEASUREMENT OF MASS

Mass is the amount of matter contained in an object. Measurement of mass helps us to distinguish between a lighter or a heavier body. Beam balance, spring balance and electronic balance are used to measure mass of different objects. The SI unit of mass is the kilogram (kg).

Figure : Beam balance

Figure : Electronic balance

Figure : Spring balance

Different units are used to measure the mass of different objects depending upon their weight, e.g. weight (mass) of a tablet is measured in milligrams (mg), weight of a person is measured in kilograms (kg), weight of a truck is measured in metric tons.

Focus Point

- 1000 milligrams = 1 gram
- 1000 grams = 1 kilogram
- 100 kilograms = 1 quintal
- 10 quintals = 1 metric ton

7.5 MEASUREMENT OF VOLUME OR CAPACITY

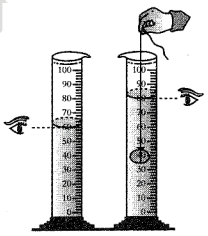
The three-dimensional space occupied by an object is known as its volume or capacity.

Though volume of a container is expressed in cubic metres (or m^3), for the sake of convenience, the same volume can also be expressed in litres.

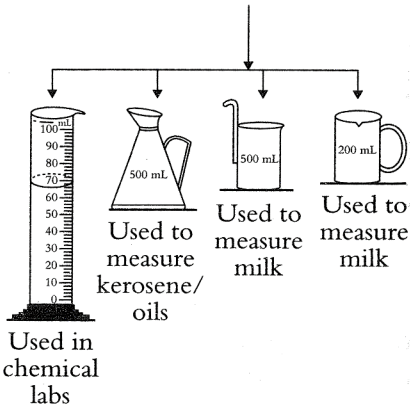
$1\ m^3 = 1000$ L ; 'L' represents litre

Measurement of volume

- Volume of solids
  - Volume of regular solids
    - *Method* : Using formulas
    - Volume of cuboid $= \ell \times b \times h$
    - Volume of cylinder $= \pi r^2 h$
    - Volume of cube $= \text{Side}^3$
    - Volume of sphere $= \frac{4}{3}\pi r^3$
  - Volume of irregular solids
    - *Method* : Finding the volume of an irregularly shaped stone using a measuring jar with some water in it.



- Volume of liquids
  - ⇒ The amount of liquid that can fill a container is called volume of liquid or capacity of a container
  - ⇒ Volume of liquid can be measured called measuring jars to measure volume of different liquids



7.6 MEASUREMENT OF TIME

Every event in this universe happens at a particular time, e.g. the Earth completes its one revolution around the Sun in a fixed duration, occurrence of eclipses etc. The instruments used in ancient time for the measurement of time were sundials and water clocks. Later more reliable devices were invented like pendulum clock (a weight hung from a fixed point so that it can swing freely), digital watches etc. Today, digital watches are used which are very accurate. They are also used as timers in ovens, stopwatches etc. The SI unit of time is second (s)

Water clock

Sundial

Pendulum clock

Mechanical clock

Digital clock

Different units of time are used to measure the duration of different events. For e.g., duration of a movie is represented in terms of hours, occurence of eclipses is expressed in days, duration of season is expressed in months etc.

Focus Point

- 60 seconds = 1 minute
- 60 minutes = 1 hour
- 24 hours = 1 day
- 365 days = 1 year
- 10 years = 1 decade
- 10 decade = 1 century (100 years)
- 10 centuries = 1 millennium (1000 years)

8. MOVING THINGS AROUND US

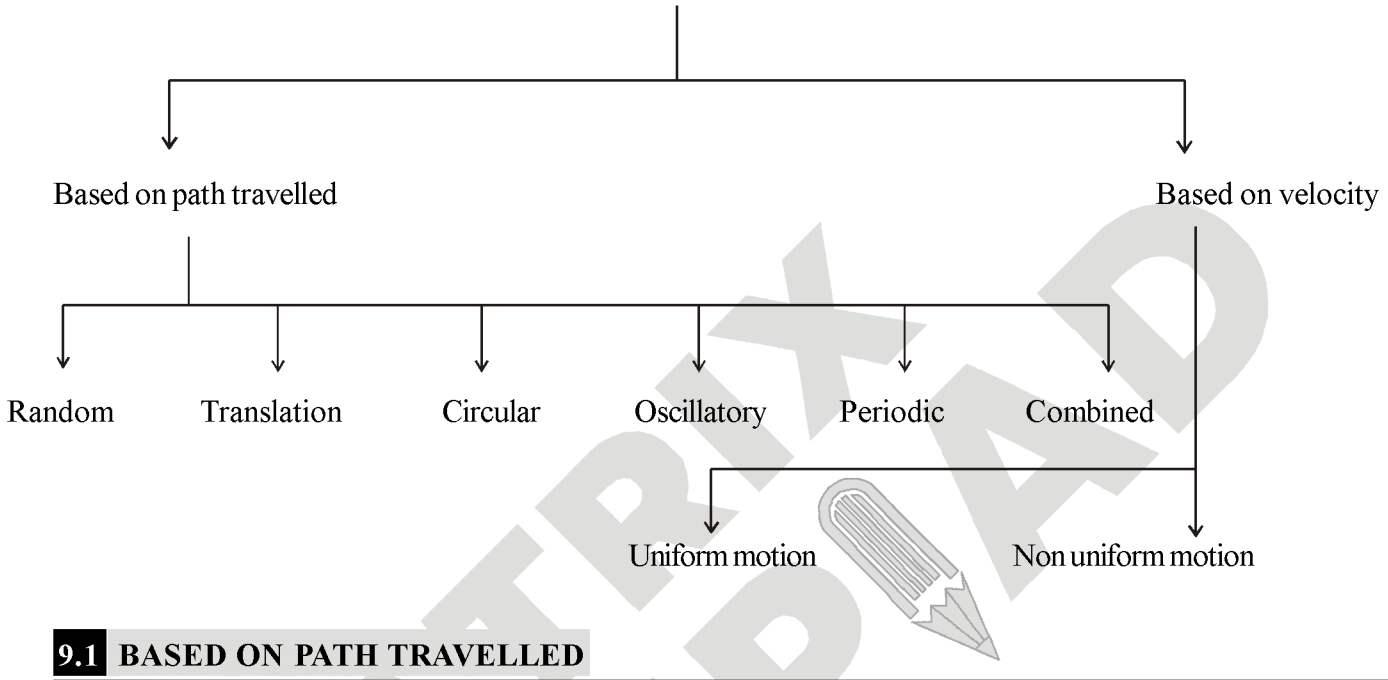
8.1 MOTION

All living being show motion, whereas the non-living thing show motion only when some force is acting on them. Motion is always observed and measured with respect to a frame of reference. When you sit in a moving bus, you are at rest with respect to the bus but you are moving with respect to the observer outside. Hence, rest and motion are relative terms. Therefore, if an object changes its position with time, It is said to be moving or in motion and if an object does not show any change in its position with time, It is said to be stationary or at rest.

9. CLASSIFICATION OF MOTION

Objects move in various ways. Some move very fast and some very slow. Motion can be classified into many types

Classification of motion



9.1 BASED ON PATH TRAVELLED

Random

Irregular motion of an object in which the direction of motion is not fixed is called random motion. An ant moving on ground shows random motion.

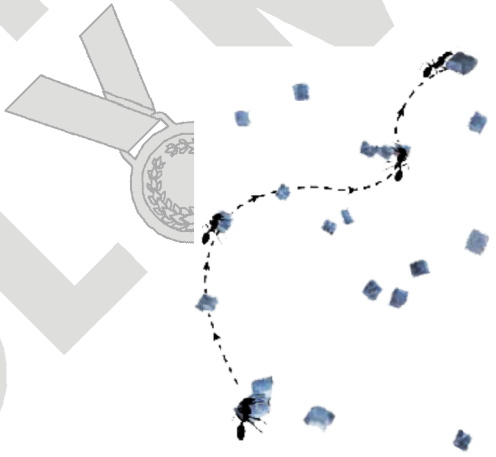


Figure : Motion of an ant

Translation

If an object moves on the whole, from one place to another, so that all its body part move the same distance in a given time, it is said to be in a translational motion. It is of two types :

(1) Rectilinear motion : If an object moves in a straight line it is said to have rectilinear motion.

(2) Curvilinear motion : If an object moves along a curved path, its motion is called curvilinear motion.

Figure : a car moving on a straight path shows rectilinear motion

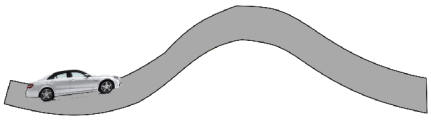


Figure : A car moving on curved path shows curvilinear motion

Circular

When a body moves in circular path around a fixed point, that point is known as its axis and motion is called Circular motion. Circular motion is also of two types :

(1) Revolutionary motion : When an object as a whole moves on a circular path its motion is called revolutionary motion. e.g.

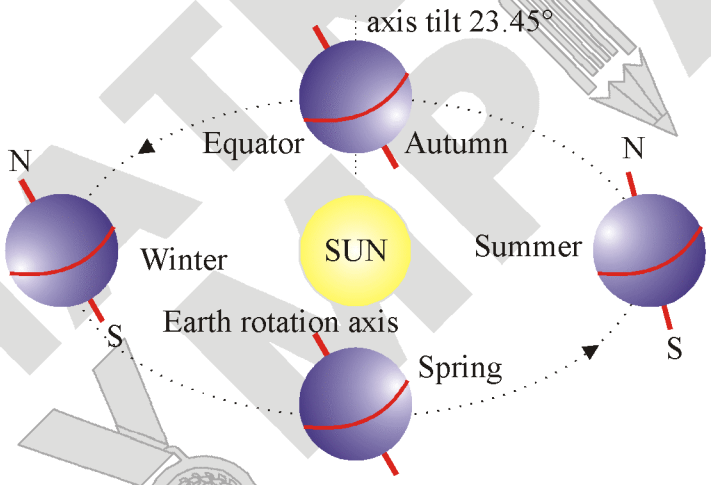


Figure : Revolution of earth around the sun

(2) Rotatory motion : When an object undergoes translation motion in such a way that its parts cover different distances in a given time, it is said to have rotatory motion.

e.g.

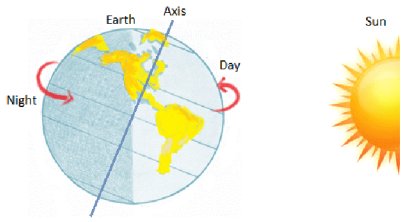


Figure : Rotation of the earth on its axis

Oscillatory

When an object moves to-and-fro about a fixed point, it is said to be in oscillatory motion.
Bob in the pendulum clock shows oscilltory motion

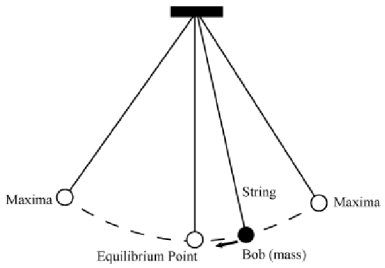


Figure : Oscillatory motion of a Pendulum

Periodic

The motion which repeats itself after a period of time is called a periodic motion. On the other hand, the motion which does not repeat itself at equal interval of time is called non-periodic. The hour and second hand of a watch shows periodic motion.

Figure : Wrist watch

Combined

When an object shows more than one kind of motion at the same time, its motion is called combined motion. The Earth rotates (rotational motion) about its axis and at the same time it revolves (rotational motion) about its axis and at the same time it revolves around the Sun in a circular path (translation motion).

9.2 BASED ON VELOCITY

The motion of bodies can be classified based on two parameters, they are path travelled and based on the velocity of the body.

Uniform Velocity

If a body travels equal distance in equal intervals of time, then the body is said to be in uniform motion

Figure : Car moving with uniform velocity

If a body moves with uniform speed or uniform velocity, then the body is said to be in uniform motion.
Example : Car moving at a speed of 20 miles per hour.

Non-Uniform Velocity

If a body travels unequal distances in equal intervals of time, then the body is said to be in non-uniform motion.

Figure : Car moving with non–uniform velocity

10. TRANSPORTATION

Transportation is the process of travelling from one place to another. Transportation is an integral part of our lives. In ancient time, people used animals to haul their loads. For travelling in water, wooden logs with a hollow cavity in them were used. Later on, people learnt to put together different pieces of wood and give shapes to the boat. Invention of wheels brought a revolutionary change in the modes of transportation. This led to the invention of vehicles such as cars, bicycles, motorcycles and trains, etc.

Figure : Different stages of evolution of transportation

Now, there are a number of modes of transport available and it has become important to have measurement techniques for quantities like mass, distance, time etc., so that could choose an appropriate mode of transport.

SOLVED EXAMPLES

SE. 1

Convert the following as directed :

(i) 7 m into cm. (ii) 5 cm into mm.

(iii) 8 dm into cm. (iv) 2000 m into km.

Ans. (i) 1 m = 100 cm ∴ 7 m = 700 cm.

(ii) 1 cm = 10 mm ∴ 5 cm = 50 mm

(iii) 1 dm = 10 cm ∴ 8 dm = 80 cm

(iv) 1 km = 1000 m ∴ 2000 m = 2 km

SE. 2

State the type of motion involved in the following.

(i) Movement of tip of the second hand in one minute.

(ii) Movement of a top on the ground.

(iii) Motion of moon around the Earth.

(iv) A stone thrown into the air at some angle.

Ans. (i) Revolutionary motion and periodic motion

(ii) Rotational motion

(iii) Revolutionary motion and periodic motion

(iv) Curvilinear motion

SE. 3

Convert the following as directed:

(i) 5000 g into kg. (ii) 1000 kg into quintal

(iii) 1 hour into seconds (iv) 2 decade into years

Ans. (i) 1 kg = 1000 g ∴ 5000 g = 5 kg

(ii) 1 quintal = 100 kg ∴ 1000 kg = 10 quintal

(iii) 1 hour = 60 min. and 1 min. = 60 s

∴ 1 hour = 60 × 60 s = 3600 s

(iv) 1 decade = 10 years ∴ 2 decade = 20 years

SE. 4

Define the following.

(a) Fathom (b) Cubit (c) Span

Ans. (a) Fathom : A measure of length corresponding to the outstretched arms,

(b) Cubit : A unit of linear measure equal to the length of the forearm.

(c) Span : The space from the thumb to the end of the little finger when extended is known as span.

SE. 5

Classify the following quantities as fundamental and derived : mass, area, volume, time, force, length, pressure.

Ans. Fundamental Quantities : Mass, length and time.

Derived Quantities : Area, volume, force, pressure.

SE. 6

What is the most appropriate unit for the measurement of the thickness of the coin?

Ans. Millimetre (mm) is the most appropriate unit for the measurement of the thickness of coin.

SE. 7

Why we prefer digital balance to measure mass of an object?

Ans. Digital balance can be used very easily and is most sensitive and accurate. Therefore we prefer digital balance to measure mass of an object.

SE. 8

Why we can't take arm length as the standard unit of length?

Ans. Since length of arm is different for different persons therefore we cannot take arm length as the standard unit of length.

SE. 9

Write the units of length and mass used in different system of units : MKS, CGS and FPS.

Ans. In MKS system, the unit of the length and mass are metre and kilogram respectively. In CGS system, the units are centimetre and gram. In FPS system, the units used are foot andpound.

SE. 10

Why stopwatch is used in athletics meet to measure time instead of a wrist watch?

Ans. Stopwatch can be started or stopped at precise moments. Therefore it is used to measure time in athletics meet.

EXERCISE – I

ONLY ONE CORRECT TYPE

1. Quantity that can be measured is called :
(A) Physical quantity (B) Unit
(C) Measurement (D) Motion

2. The SI unit of mass is :
(A) Gram (B) Kilogram
(C) Milligram (D) Pound

3. The SI unit of time is :
(A) minute (B) second
(C) hour (D) none of these

4. 25 m =
(A) 2500 cm (B) 250 mm
(C) 2.5 km (D) 25000 cm

5. A fixed quantity that is used as a standard of measurement is called :
(A) Distance (B) Unit
(C) Weight (D) Time

6. Distance between Delhi and Chennai can be measured in :
(A) kilometres (B) metres
(C) centimetres (D) millimetres

7. 1 metric ton =
(A) 10 quintals (B) 100 quintals
(C) $\frac{1}{10}$ quintals (D) $\frac{1}{100}$ quintals

8. _____ cannot be used as the unit of length for measurement :
(A) Fist (B) Foot
(C) Cubit (D) Fathom

9. The SI unit of time is :
(A) minute (B) second
(C) hour (D) none of these

10. Rulers, metre scales and measuring tapes are used to measure :
(A) length (B) weight
(C) mass (D) time

11. CGS stands for :
(A) centimetre, gram, second
(B) centilitre, gram second
(C) centimetre, gram, standard
(D) Only (A) and (B)

12. MKS system is similar to :
(A) CGS system (B) FPS system
(C) SI system (D) None of these

13. The length between the great toe and end point of the heel is :
(A) foot (B) cubit
(C) hand span (D) arm length

14. Milk : Volume : : Vegetables : ? : : Fever : Temperature
(A) Area (B) Volume
(C) Length (D) Mass

15. Identify the correct one :
(A) 26 kgs (B) 26kgs
(C) 26 Kg (D) 26 kg

16. Instrument(s) used for measuring mass is/are :
(A) Spring balance (B) Beam balance
(C) Both (A) and (B) (D) Neither (A) nor (B)

17. 1000^{th} part of 1 km is called :
(A) decimetres (B) metres
(C) centimetres (D) decametres

18. The motion that is repeated at regular interval of time is :
(A) vibratory motion (B) linear motion
(C) random motion (D) None of these

19. Which one of these is true about motion :
(A) Motion is relative
(B) Motion is not relative
(C) Something is not in motion if its position with respect to the observer changes with time
(D) Both (A) and (C)

20. The movement of a drill is an example of :
(A) Circular and rotational motion
(B) Circular and linear motion
(C) Rotational and linear motion
(D) Oscillatory motion

21. The motion in which an object moves such that its distance from a fixed point remains the same is :
(A) Translational motion (B) Circular motion
(C) Oscillatory motion (D) Random motion

22. Motion produced by sound waves is :
(A) Periodic (B) Non-periodic
(C) Circular (D) Rotational

23. Direction of the movement of the body will not change in case of :
(A) Rectilinear motion (B) Circular motion
(C) Periodic motion (D) Rotational motion

24. Which of the following is the fastest mode of transport ?
(A) Bicycle (B) Car
(C) Tonga (D) Aeroplane

25. Discovery of _____ made the transport easy :
(A) Fire (B) Stone tools
(C) Wheel (D) Bullock cart

PARAGRAPH TYPE

PARAGRAPH # 1

The speed of a body gives us an idea of how slow or fast that a body is moving. Speed of a body is the distance travelled by it per unit time. The SI unit of speed is metre per second. It is a scalar quantity. The speed of a running car at any instant of time is shown by an instrument called 'speedometer' and the distance travelled by a car is 'speedometer' and the distance travelled by a car is measured by another instrument called 'odometer'

26. Which of the following is not the correct unit of speed
(A) m/s (B) km/h
(C) km/h^2 (D) cm/s

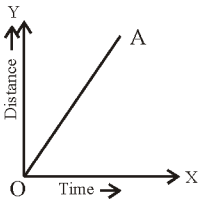
27. If the distance travelled by an object in 5 seconds is 25 m, then its speed will be :
(A) 50 m/s (B) 5 m/s
(C) 5 km/h (D) 50 km/h

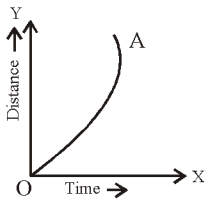
28. If an object is moving with speed (s) in time (t), then, the distance (d) will be :
(A) $d = s \times t$ (B) $d = \frac{s}{t}$
(C) $d = \frac{t}{s}$ (D) None of these

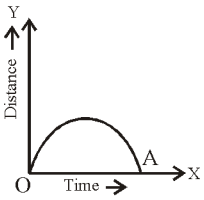
PARAGRAPH # 2

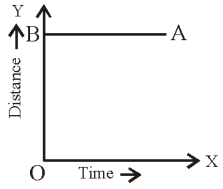
A body is said to be in motion when its position changes continuously with respect to a stationary object taken as reference point. A body has a uniform motion if it travels equal distance in equal intervals of time, no matter how small these time intervals may be. The distance-time graph for uniform motion is a straight line. A body has a non-uniform motion if it travels unequal distance in equal intervals of time. The distance-time graph for a body having non-uniform motion is a curved line.

29. The distance-time graph for a uniform motion is :

(A) 

(B) 

(C) 

(D) 

30. Motion of a freely falling body is an example of :

(A) Uniform motion

(B) Non-uniform motion

(C) Circular motion

(D) Rotational motion

31. If a body travels 2 metres in 1st second, 3 metres in 2nd second and then, travels with a constant speed, the motion of the body is :

(A) Oscillatory (B) Uniform

(C) Non-uniform (D) Circular motion

MATCH THE COLUMN TYPE

32.

Column I	**Column II**
(a) Movement of planets around the sun	(p) Oscillatory motion
(b) Motion of potters wheel	(q) Revolution
(c) Movement of a swing along parallel tracks	(r) Rectilinear motion
(d) Movement of train	(s) Rotatory motion

(A) a-q, b-s, c-p, d-r (A) a-s, b-p, c-r, d-q

(C) a-p, b-r, c-q, d-s (D) a-r, b-q, c-s, d-p

33.

Column I	**Column II**
(a) MKS	(p) Pound
(b) Electric current	(q) Kelvin
(c) FPS	(r) Ampere
(d) Temperature	(s) Metre

(A) a-q, b-s, c-p, d-r (B) a-s, b-r, c-p, d-q

(C) a-p, b-r, c-q, d-s (D) a-r, b-q, c-s, d-p

EXERCISE – II

VERY SHORT ANSWER TYPE

1. What do you mean by physical quantities ?
2. Define measurement ?
3. Define standard unit ?
4. Define motion ?
5. What is the full form of SI system ?
6. State any two characterstics of a unit ?
7. Give one example of linear motion.
8. Why can hand span and arm length not be used as standard units of length ?
9. Give an example of circular motion.
10. Arrange the following in decreasing order :
    1 km, 1m, 1cm, 1mm.

SHORT ANSWER TYPE

1. Defferentiate between revolution and rotation ?
2. Distinguish between periodic and non-periodic motion ?
3. Reema is 10 cm taller than shikha Height of shikha is 160 cm. What is height of Reena ?
4. State two precautions to be observed while measuring length with the help of a metre scale.
5. Define motion and rest.

LONG ANSWER TYPE

1. What are different types of motion ? Give two example of each.
2. How to measure the path of a curved length ?
3. What are the fundamental units of SI system ? list them
4. Differentiate fundamental units & Derived units with examples.
5. Define the followings
   (i) Measurement (ii) Physical quantity
   (iii) Unit (iv) Motion

TRUE / FALSE TYPE

1. The SI unit of current is ampere.
2. When the skin of a tabla is beaten, it undergoes fast periodic motion.
3. A hand span is a reliable measure of length.
4. The knowledge of the distance between various places helps us in determining the time taken to travel to these places.
5. Centimetre is the SI unit of measurement.

FILL IN THE BLANKS

1. In SI system mass is measured in _____
2. Unit of _____ is the same in all the systems of measurements.
3. A thread of length 20 cm is made into square, then the length of its side is _____.
4. The short hand of a clock is at 12 and the minutes hand is 3, then the time at that instant is is _____.
5. A passanger in a moving bus appears to be in a state of rest with respect to _____.

NUMERICAL TYPE

1. Convert 0.2 km in m, cm, mm, dm, μm.
2. Express in seconds
   (i) 3 minutes 15 seconds
   (ii) 5 hour 2 minutes 5 seconds
3. Find the volume of
   (i) a cube of side 14 cm
   (ii) a cuboid of dimension 18 cm × 120 mm × 150 mm
   (iii) a sphere of radius 5 cm.
4. How are these units related to S.I. unit of area ?
   (i) 1 km^2 (ii) 1 hectare
   (iii) 1 cm^2 (iv) 1 mm^2
5. We have a glass full of water. When we throw a ball of radius 3 cm in it some water spills out of the glass. Measure the volume of water spilled outside ?

Answer Key

EXERCISE–I														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	B	B	A	B	A	A	A	B	A	A	C	A	D	D
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
C	B	D	A	C	B	A	A	D	C	C	B	A	A	B
31	32	33												
C	A	B												

EXERCISE – II

TRUE / FALSE

1. T 2. T 3. F 4. T 5. F

FILL IN THE BLANKS

1. kilogram 2. time 3. 5 cm 4. 12 : 15 a.m. or 12 : 15 p.m.

5. another passenger

NUMERICALS

1. 200 m, 20000 cm, 200000 mm, 2000 dm, 200000000 μm or 2×10^8 μm

2. (i) 195 seconds (ii) 18122 seconds

3. (i) 2744 cm^3 or 0.002744 m^3 (ii) .00324 m^3 (iii) 5.24×10^{-4} m^3

4. (i) 10^6 m^2 (ii) 10^4 m^2 (iii) 10^{-4} m^2 (iv) 10^{-6} m^2

5. 1.13×10^{-4} m^3 or .11 L

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : MOTION AND MEASUREMENT OF DISTANCE)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

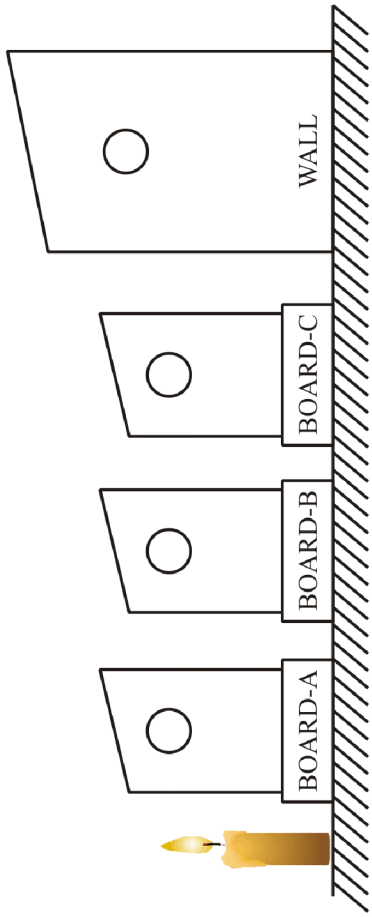
1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

LIGHT, SHADOWS AND REFLECTIONS

2

Concepts



INTRODUCTION

Light helps us to see other things around us but it itself is not visible. To view anything, we need a source of light like the sun, lighted bulb, burning candle etc.

1. OBJECTS ON BASIS OF VISIBILITY

Object like sun that gives out or emits light of its own is called luminous object. Firefly, glowworm, etc. also emit light. You can observe them glowing at night. Bulb, torch, candle, etc. are artificial sources of light.

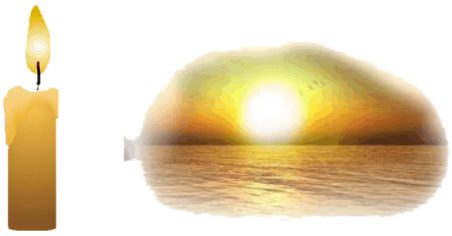


Figure : Luminous objects

Figure : Non-luminous objects

Objects like chair, painting, book, etc. can be seen in the presence of a source of light such as sun, lighted bulb, or torch etc. Such objects that do not have light of their own but are visible when light falls on them are called non-luminous objects. Those objects are visible due to the reflection of light falling on them.

During the day, your room is lighted because of reflection of sunlight by the several non-luminous objects around you. Moon is a non-luminous object which shines because it reflects the light of the sun to us.

2. TYPES OF LIGHT SOURCES

There are countless sources of light but they can all be categorized under either of the two following categories-

- Natural sources
- Artificial sources

2.1 NATURAL LIGHT SOURCES

The universe is filled with objects that emit light. Some of the light from these sources reach the earth. The following things in nature have the ability to emit light:

(i) The Sun is the major source of light for the earth.

(ii) Every other star produces light too, but only a small or no amount of it reaches the earth because of the huge distance.

(iii) Certain other natural phenomena such as lightning and volcanic eruptions also emit light.

2.2 ARTIFICIAL LIGHT SOURCES

Apart from the natural sources, light can be produced artificially too. The different light sources produced artificially can be put under three broad categories–

(i) Incandescent Sources:

When certain objects are heated to a high temperature, they begin to emit light. Both infrared and visible light is produced in the process.

Example- Candle, incandescent lamp.

(ii) Luminescent Sources:

Light can be produced by accelerating charges in a luminescent material. One common way of doing it is by passing current through the material.

Example- Fluorescent tube light, electric bulb

(iii) Gas Discharge Sources:

Passing electricity through certain gases at a very low pressure can produce light too.

Example - Neon lamp, Sodium lamp.

3. TRANSPARENT,OPAQUE AND TRANSLUCENT OBJECTS

Objects can be classified into transparent, translucent and opaque on the basis of their ability to pass light through them. **Transparent** objects allow light to pass through them completely. Glass, air, etc. are the examples of transparent objects.

Translucent objects allow some light to pass through them. Butter paper, ground glass, thin plastic sheets, etc. are the examples of translucent objects.

Opaque objects do not allow light to pass through them. Cardboard piece, wood, etc. are the examples of opaque objects.

Figure : Transparent

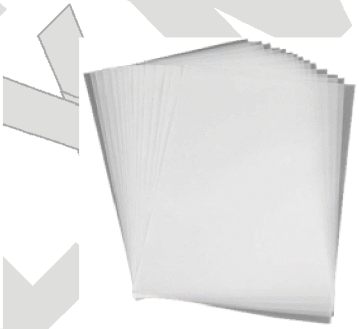


Figure : Translucent

Figure : Opaque

LAB TIME
Let's Do & Learn

Aim : To prove that light travels in a straight line.

To identify transparent, translucent and opaque objects around you.

Collect as many objects as possible around you, such as chalk,

Table : Objects based on tranparency book, pencil, pen, eraser, geometry box, lunch box, scale (ruler), paper, handkerchief, school bag, water bottle, shirt, trouser, tissue paper, glass tumbler, etc. You can add more objects to the list. Try to see far away things through each of these objects.

If you are able to see clearly through an object, record it as transparent object.

If you are able to see but not clearly through an object, record it as translucent object.

If you are unable to see at all through an object, record it as opaque object.

S.No.	Name	Type of object
1	Chalk	Opaque
2	Book	
3	Pencil	
4	Pen	
5	Eraser	
6	Geometry box	
7	Lunch box	
8	Scale (ruler)	
9	Paper	
10	Handkerchief	
11	School bag	
12	Water bottle	
13	Shirt	
14	Trouser	
15	Tissue paper	Translucent
16	Glass tumbler	Translucent

4. GENERAL TERMS USED IN LIGHT

Let us understand some basic terms related to light in the following points :

(i) Ray of light : The path along which the light energy travels is called ray of light

(ii) Beam of light : A collection of a large number of light rays is called beam of light.

Figure : Beam of light

(iii) Convergent beam of light : A collection of light rays from different directions that meet at a point is called convergent beam of light.

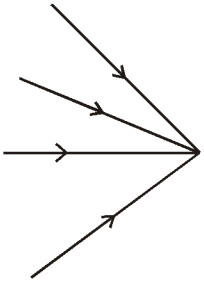


Figure : A convergent beam of light

(iv) Divergent beam of light : A collection of light rays from a point to different direction is called divergent beam of light.

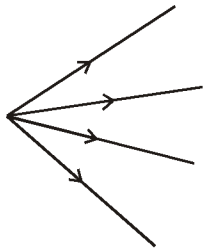


Figure : A divergent beam of light

(v) Intensity of light (Brightness) : The light energy emitted per unit surface area of light source per unit time is called intensity of light.

The intensity of light is measured in foot candle.

1 foot candle = 10.76 Lux.

(vi) Luminosity : The amount of light emitted by a light source per unit time irrespective of the area of light source is called luminosity

the luminosity value is measured in lumens

1 Lumen = 12.56 candle power.

5. WHAT EXACTLY ARE SHADOWS ?

An opaque object blocking the path of light is called a shadow. A shadow is a dark region, and is formed only when a light source, an opaque object and a screen are present. Opaque objects form shadows because light is not able to bend around them. Shadows are seen more clearly on light screens. Whatever the colour of the object, its shadow is always black because it is not illuminated by light. The length and shape of a shadow depends on the object by which it is formed.

6. RECTILINEAR PROPAGATION OF LIGHT

In the early morning we usually observe that light rays coming from the windows are in straight line. This property of light travelling in a straight line is known as rectilinear propagation of light.

A sample activity is described below to better understand rectilinear propagation of light.

LAB TIME
Let's Do & Learn

Aim : To prove that light travels in a straight line.

Apparatus : Candle, match box, three cardboards with a hole.

Principle : Opaque body obstructing the path of light.

Construction and working : Arrange the candle and cardboards in front of a wall as shown in the figure below.

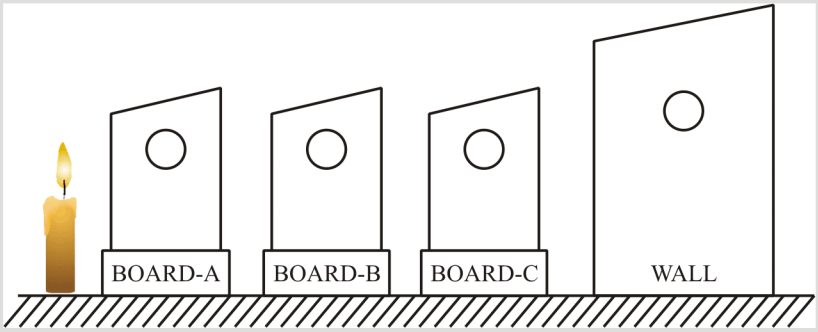


Figure: Arrangement of candles and cardboards to demonstrate rectilinear propagation of light

Light energy from candel passes through the holes of cardboards and it is incident on the wall as shown in figure.

7. SHADOW

Dark region is formed on the screen when an opaque object is placed in the path of light, it is called shadow. Following are the basic requirements to form a shadow.

(i) Source of light

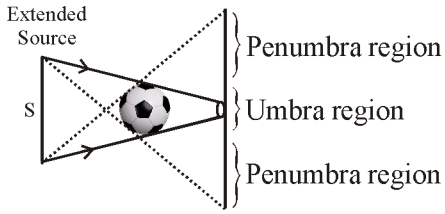
(ii) Opaque body to obstruct light.

(iii) Opaque screen to receive the shadow.

⇒ The darker region of shadow at its centre is called umbra region.

⇒ The partially dark region of a shadow around the umbra is called penumbra region.

⇒ For the fixed positions of source of light, for instance take the object and screen, if the source used is an extended source, then the penumbra will be greater than the umbra region as shown in figure (a). If the source is a point source, then the umbra region of shadow is greater than the penumbra region as shown in figure (b)



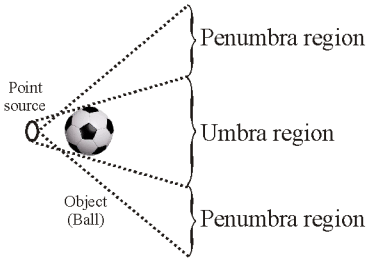


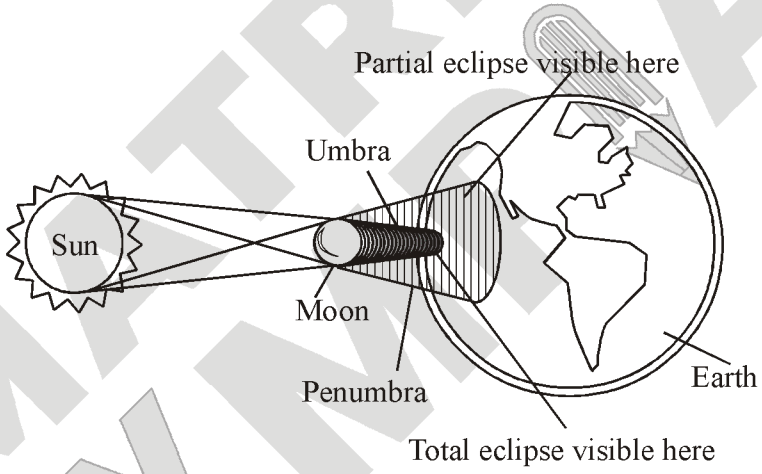
Figure (a) formation of shadow by an extended source

Figure (b) formation of shadow by a point source:

8. ECLIPSE

8.1 SOLAR ECLIPSE

(i) While moon revolves around the earth a situation arises where the moon comes in between the sun and the earth, it is evident that a shadow of moon is formed on a part of earth, it is known as solar eclipse.



(ii) This occurs on a day when the moon is not seen, i.e, on new moon day

(iii) The umbra region of this shadow of moon formed on earth is known as total solar eclipse.

(iv) The penumbra region of this shadow is called partial solar eclipse

(v) People living under the umbra region of shadow could see only the outer rim of the sun due to the presence of moon in between the sun and the earth. This rim of sun is called corona.

(vi) The total solar eclipse lasts for five to ten minutes.

Precaution : During solar eclipse, the earth receives very large amounts of ultravioloet (UV) rays. These ray can even burn the retina of the eye.

8.2 LUNAR ECLIPSE

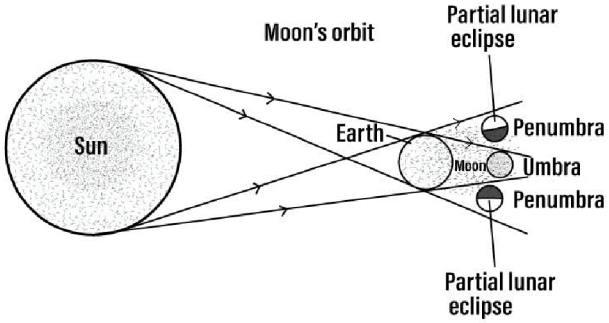


Figure : Phenomenon of lunar eclipse

(i) Lunar eclipse is caused on a full moon night

(ii) While the sun, the moon the earth revolve, there arises a situation where all these three come in a stright line with earth at the centre. In this eclipse, the shadow of earth falls on the moon and the moon completely disappears.

(iii) This occurs and lasts for one to two hours.

(iv) This occurs at least once in a year

Do You Know

The Pinhole camera is an application of rectilinear propagation of light. It is a simple optical imaging device, in the shape of a closed chamber. In one of its side is a small hole which, via the rectilinear propagation of light creates an image of an object outside the box on the opposite inner wall of the box.

9. MIRRORS AND REFLECTIONS

The likeness of an object carried and formed by light in a mirror is called an image. We all use mirrors at home. You look into the mirror and see your own face inside the mirror. What you see is a reflection of your face in the mirror. We also see reflections of other objects that are in front of the mirror. An image can be seen in the mirror because the light reflected from an object falls on the mirror and it is reflected. So, light incident on any smooth shiny surface like a mirror bounces back into the same medium. This bouncing of light by any smooth surface is called reflection of light. Mirrors change the direction of light incident on them. The image in a plane mirror is the same size and colour as that of the object. Moreover, the distance between the image and the mirror, is the same as the distance between the mirror and the object. Sometimes, we see reflections of trees, buildings and other objects in the water of a pond or a lake.

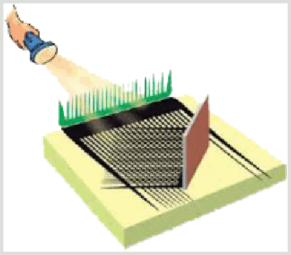
LAB TIME
Let's Do & Learn

To observe that light travels in a straight line and gets reflected from a mirror.

⇒ Take a large thermocol sheet and pase a sheet of paper on it.

⇒ Take a comb and a mirror.

⇒ Fix the comb on one side of the thermocol sheet and the mirror on the other side as shown in figure.



⇒ Direct a beam of torch light through the comb.

⇒ What do you observe ?

You will get a pattern as shown in the figure.

This shows that light trvels in a straight line and gets reflected from a mirror.

10. REFLECTION OF LIGHT

The phenomenon of bouncing back of light from a smooth polished surface when light is incident on it is called reflection of light. Here are some of the terms used in this reference.

(i) Mirror : Smooth polished surface which can turn back the light rays into the same medium is called mirror.

(ii) Incident ray : Light ray which is incident on a mirror is known as incident ray.

(iii) Reflected ray : Light ray which bounces off from the mirror surface is called reflected ray.

(iv) Point of incidence : The point on the mirror surface where the incident ray strikes the surface is called point of incidence.

(v) Normal : The perpendicular line drawn at the point of incidence to the surface of mirror is called normal.

(vi) Angle of incidence : The angle between incident ray and the normal at the point of incidence is called angle of incidence.

(vii) Angle of reflection : The angle between the reflected ray and the normal is called angle of reflection.

In the below figure, i is the angle of incidence and r is the angle of reflection, AB is the incident ray, BC is the reflected ray and NN^1 is normal to the reflecting surface.

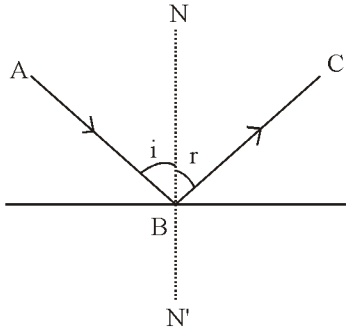


Figure : Reflection of light by a plane mirror

LAB TIME
Let's Do & Learn

This activity should be done at night or in a dark room. Ask one of your friends to hold a mirror in his/her hand at one corner of the room. Stand at another corner with a torch in your hand. Cover the glass of torch with your fingers and switch it on. Adjust your fingers with a small gap between them so that you can get a beam of light. Direct the beam of the torch light onto the mirror that your friend is holding. Do you see a patch of light on the other side (Fig.) Now adjust the direction of the torch so that the patch of light falls on another friend standing in the room. This activity suggests that a mirror changes the direction of light that falls on it. Here is an activity that shows light travelling along straight lines and getting reflected from a mirror.

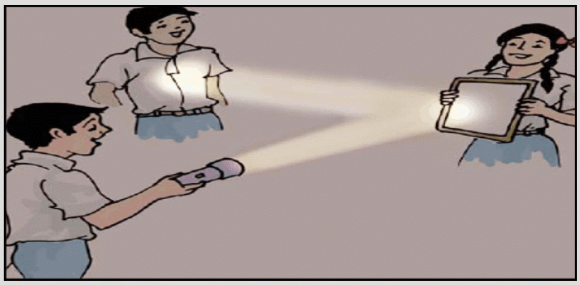


Figure : A mirror reflects a beam of light

10.1 TYPES OF REFLECTION

Depending upon the surface on which light is incident, reflection can be of different types.

Types of reflection

Regular reflection

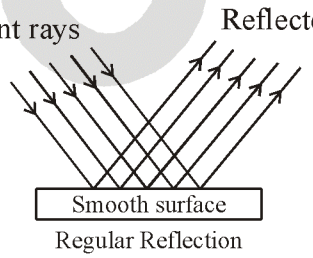
↓

Parallel beam of light incident on smooth surface are reflected back as parallel beam

↓

This occurs on mirrors, smoothly polished surfaces, etc.

↓



Irregular reflection

↓

Parallel beam of light incident on rough surface are not reflected back as parallel beam.

↓

This occurs on surfaces of stones, walls, trees, etc.

↓

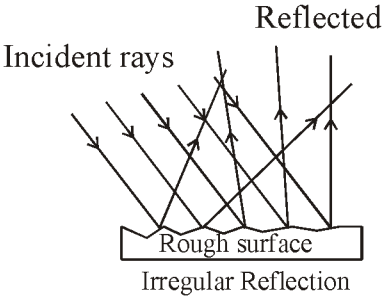


Figure : Regular and irregular reflection

11. PLANE MIRORR

A plane mirror is a mirror with a flat (planar) reflective surface. For light rays striking a plane mirror, the angle of reflection equals the angle of incidence. The angle of the incidence is the angle between the incident ray and the surface normal (an imaginary line perpendicular to the surface).

11.1 NATURE OF IMAGE FORMED BY PLANE MIRROR

The image formed by a plane mirror has certain unique properties as given in flowchart below

Nature of an image formed by a plane mirror

- Image formed is laterally inverted
  - If we see ourself in the mirror, our left side looks like right side and vice versa as shown in the below figure.
- Distance of an object from the mirror is equal to the distance of image from the mirror
  - If you stand in front of a mirror, you will observe that your image and you are at the same distance from the mirror.
- Image formed is virtual and erect
  - The image seen in the mirror can't be formed on a screen placed in place in place of mirror.

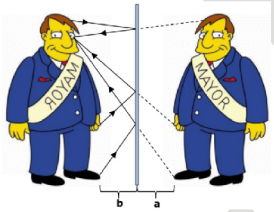


Figure : Lateral inversion

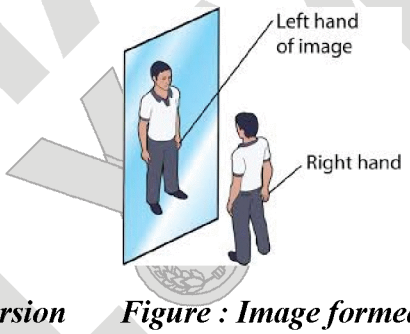


Figure : Image formed by a plane mirror

11.2 APPLICATION OF PLANE MIRROR

Plane mirrors are used in a variety of ways as given below in the flowchart.

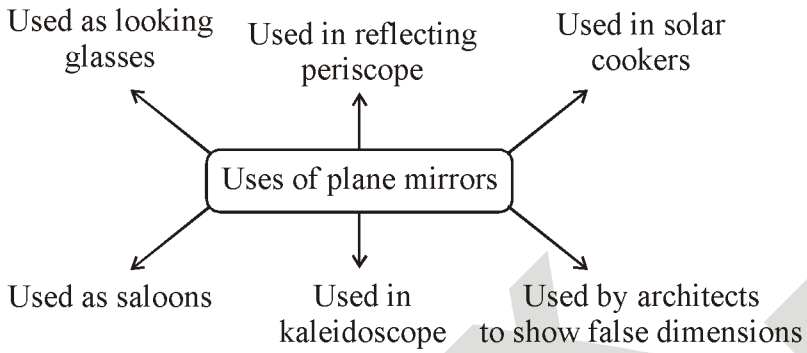


Figure :

Reflecting Periscope

Hippolyte Marie-Davy invented the periscope

Construction :

(a) Reflecting periscope is a tube which is bent twice at right angles.

(b) At the bends of the tube, plane mirrors are arranged such that they make an angle of 45° with the frame of tube as shown in the figure.

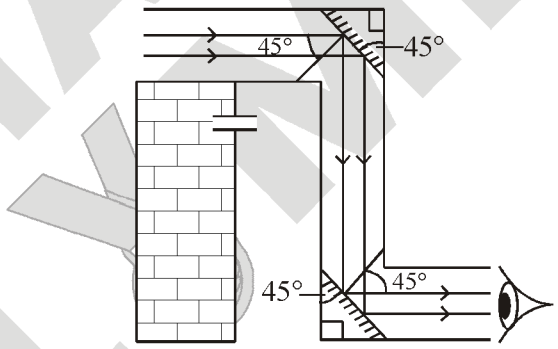


Figure : Reflecting periscope

Working :

(i) Light rays from an object at a higher level enter the tube and it undergoes reflection twice at the two mirros arranged in the periscope.

(ii) Finally, the image of an object is seen the lower end of the periscope.

Use : A person hidden behind a wall could be able to see the other side of the wall using the reflecting periscope.

SOLVED EXAMPLES

SE. 1

What is shadow ?

Ans. A shadow is a region without light that forms behind the opaque object.

SE. 2

What is the difference between luminous and non-luminous objects ?

Ans. Objects which emit light of their own are called luminous objects and objects that do not have light of their own but are visible when light falls on them are called non-luminous objects.

SE. 3

(i) Light is a form of ..... . It travels in a ..... .

(ii) A ..... is always black irrespective of the colour of the ..... .

Ans. (i) energy, straight line

(ii) shadow, light

SE. 4

Unscramble each of the following to form a word.

(a) HGLTI, (b) PUAEQO, (c) HADWOS, (d) NOUMLISU

Ans. (a) HGLTI : LIGHT

(b) PUAEQO : OPAQUE

(c) HADWOS : SHADOW

(d) NOUMLISU : LUMINOUS

SE. 5

Why do we not see the shadow of an aeroplane or a flying bird ?

Ans. We do not see the shadow of an aeroplane or a flying bird because of the very large distance between the object (an aeroplane or a bird) and the screen (ground). At a very large distance, the shadow becomes invisible as the darkness of the shadow decreases with the increase in the distance between the object and the screen.

SE. 6

Go to a room. Switch off all the lights and pull the curtains of all the window(s) and close the door(s). Can you observe any shadow ?

Ans. No, we cannot observe any shadow because no source of light is present.

SE. 7

Identify non-luminous object : Sun, stars, moon.

Ans. Moon is a non-luminous object.

SE. 8

Do transparent and translucent objects form shadows ?

Ans. A transparent object does not form shadow but a translucent object forms a shadow.

SE. 9

AMBULANCE in ambulance is written as ƎɔИAꞀUꞀMA. Give answer to the given questions :

(i) Why is ambulance written in reverse order ?

(ii) In reverse of ambulance, which alphabets are written as same ?

Ans. (i) This is done so that the driver of any vehicle in front of the ambulance is able to read the word 'AMBULANCE' correctly in his rear-view mirror.

(ii) Alphabets 'A', 'M' and 'U'are written as same.

SE. 10

What is reflection ?

Ans. The phenomenon of bouncing back of light from the surface of an object is reflection of light.

SE. 11

Which is greater - the speed of light or the speed of sound ?

Ans. The speed of light is greater than the speed of sound. No object can travel as fast as light

SE. 12

Give two examples of objects that allow light to pass through them but not enough for you to see through them clearly.

Ans. Butter paper and ground glass.

SE. 13

Would water flowing around a stone in its path form a shadow ?

Ans. No, water flowing around a stone in its path would not form a shadow because to form a shadow, a screen is needed

SE. 14

Rearrange the boxes given below to make a sentence that helps us to understand pinhole camera.

Came	pin	ages	hole
raca	ptures	invert	edim

Ans.

Came	pin	ages	hole
raca	ptures	invert	edim

Pinhole camera captures inverted images.

SE. 15

Which of the following statements is correct ?

(a) Only opaque objects can form shadow.

(b) Plastic scale is a transparent material.

(c) A light candle is a natural source of light.

(d) Wood is an opaque object.

Ans. Statement (d) is correct. Wood is an opaque object.

Space for Notes :

EXERCISE –I

ONLY ONE CORRECT TYPE

1. Which among the following is an artificial source of light?
   (A) Star (B) Tube light
   (C) Sun (D) Firefly
2. Which of the following is/are the natural source(s) of light?
   (A) Earth (B) Moon
   (C) Sun (D) Both (B) and (C)
3. When an object is placed in front of a plane mirror, then the right side of an object appears to become left side of image and left side of an object appears to become the right side of image. This is known as
   (A) reflection of light (B) lateral inversion
   (C) both (A) and (B) (D) neither (A) nor (B).
4. Which of the following is an opaque material?
   (A) Clear water (B) Butter paper
   (C) Plastic scale (D) Rubber
5. Which of the following gives us dark shadow on the screen when light falls on it?
   (A) Opaque material (B) Transparent material
   (C) Translucent material (D) All of these
6. When the moon's shadow falls on the Earth, we have a
   (A) lunar eclipse (B) solar eclipse
   (C) umbra (D) penumbra

7 A lunar eclipse occurs when
   (A) the Earth is between the Sun and the Moon
   (B) the Moon is between the Sun and the Earth
   (C) the Sun is between the Earth and the Moon
   (D) in all the above situations.

8. Which of the following is incorrect?
   (A) Light enables us to see different objects.
   (B) Light itself is invisible.
   (C) Light enables us to see the colours of nature.
   (D) Light has no natural source.
9. Solar eclipse occurs on a
   (A) new moon day (B) half moon day
   (C) full moon day (D)first quarter moon day.
10. A shadow is formed
   (A) behind a screen
   (B) behind an opaque object
   (C) in front of an opaque object
   (D) in between a screen and an opaque object.
11. Which of these is not a source of light?
   (A) Moon (B) Lighted candle
   (C) Stars (D) Sun
12. Which of the following is correct for an image?
   (A) It is formed when light passes through an opaque object.
   (B) It is always black.
   (C) It is formed when light is bent.
   (D) It is of the same shape and colour as the object.
13. In a pinhole camera, what kind of substance is used for a screen?
   (A) Transparent (B) Opaque
   (C) Translucent (D) All (A), (B) and (C).
14. Why can we not see lighted candle through a bent pipe?
   (A) Because bent pipe is made of opaque material.
   (B) Because of bent pipe, reflection of light does not occur.
   (C) Because light travels in a straight line.
   (D) Because we can only see through transparent material.

15. Which of the following is not a correct statement?
(A) The shadow is formed on a screen.
(B) The shadow is always black in colour.
(C) The length of the shadow of an object always remains the same.
(D) Both (A) and (B).

16. 5If you hold a mirror in front of you in a dark room, then
(A) you will see your black shadow in the mirror
(B) you will not be able to view your reflection in the mirror
(C) you will see your image in the mirror
(D) you will see the colours of your clothes in the mirror.

17. The paint behind a mirror
(A) reflects the light incident on it
(B) protects the glass of the mirror
(C) stops transmission of light through the mirror
(D) makes mirror attractive.

18. Trees covered with a large number of leaves are natural
(A) plane mirrors (B) pinhole cameras
(C) both (A) and (B) (D) neither (A) nor (B).

19. An opaque, smooth, highly polished surface, typically made of glass coated with a metal amalgam, which reflects a clear image is
(A) pinhole camera (B) mirror
(C) translucent surface (D) none of these

20. The optical, coloured appearance with every detail of the object produced on a polished surface when light from an object is reflected, is
(A) shadow (B) light
(C) image (D) ray.

21. Which of the following is an example of rectilinear propagation of light?
(A) Rainbow in the sky
(B) Shining moon
(C) Formation of shadow
(D) Rising of the Sun

22 When the distance between the source of light and object increases, the shadow
(A) becomes smaller (B) becomes larger
(C) remains same (D) none of these.

23. When the distance between the screen and object increases then the shadow
(A) becomes larger (B) becomes smaller
(C) remains same (D) none of these.

24. Umbra is the
(A) fully shaded region
(B) inner region of the shadow cast by an opaque object
(C) outer region of the shadow cast by an opaque object
(D) both (A) and (B).

25. Penumbra is ____dark because ____ light from the light sources reaches it.
(A) very; most of (B) less; most of
(C) very; some (D) less; some

PARAGRAPH TYPE

PARAGRAPH # 1

Light is a form of energy. It is light which makes possible to see things in the dark. When light falls on small particles in air, it gets turned in different directions. Sun and stars are natural luminous objects. Bulb, tube light, torch and candle are the man-made luminous objects.

All non-luminous objects are visible due to the reflection of light.

26. Moon is visible from the Earth because it
(A) is non-luminous artificial source of light
(B) reflects light of the Sun
(C) is luminous natural source of light
(D) reflects light of its own.

27. All non-luminous objects are visible due to
(A) light of the Sun only (B) light of bulb only
(C) reflection of light (D) both (a) and (B).

28. Which of these is natural luminous object ?
(A) Bulb (B) Tubelight
(C) Stars (D) Torch

PARAGRAPH # 2

Light travels in straight lines. When light reaches an objects, it can travel through the object if the object is transparent. It can be reflected from a shiny object or light can be absorbed if the object is opaque. Shadows are produced when light hits an opaque object which prevents the light beams from passing through. When an object blocks the light's path, then darkness appears on the other side. This darkness is called a shadow.

29. When is a shadow formed ?
(A) When the light is turned off
(B) When the path of light is blocked by an opaque object
(C) When an object falls on the floor.
(D) When the light is turnd on

30. Which light source causes shadows in the outdoor environment ?
(A) The Sun (B) The Lightbulb
(C) The house (D) The School

31. How does light travel ?
(A) Straight Line (B) Zig-Zag Path
(C) Circular Path (D) Curved Path

MATCH THE COLUMN TYPE

32. In this section, each question has two matching lists. Choices for the correct combination of List-1 and Listen are given as options (A), (B), (C) and (D) out of which one is correct.

List-I	List-II
(P) An opaque smooth, highly polished surface	1. Shadow
(Q) A very simple camera without any lens	2. Mirror
(R) A dark area or shape produced by an opaque object	3. Non-luminous
(S) Does not emit light of its own	4. Pinhole

(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-4, R-1, S-3
(C) P-3, Q-1, R-2, S-4
(D) P-4, Q-3, R-4, S-1

33.

List-I	List-II
(P) Shadow of the moon falling on the earth	1. Reflection
(Q) Pinhole camera	2. Solar eclipse
(R) Full moon day	3. Inverted image
(S) Bouncing back of light	4. Lunar eclipse

(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-4, Q-3, R-2, S-1
(D) P-1, Q-3, R-2, S-4

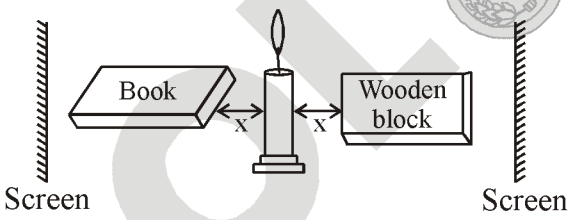
EXERCISE –II

VERY SHORT ANSWER TYPE

1. Are all natural and artificial sources of light luminous in nature?
2. Identify non-luminous objects in the following given objects: Cloth, paper, water, a candle.
3. What is the most vital and brightest source of natural light?
4. What are bioluminescent?
5. We can see a wall in front of us but cannot see the person behind it. Why?
6. Name three natural living sources of light.
7. Which of the following is more translucent:
   (i) Wet piece of paper with water, or
   (ii) Wet piece of paper with oil?
8. What is the colour of the shadow if a green coloured paper is placed in front of a light source?
9. What is the dark region of shadow called?
10. What kind of surfaces reflect light well?

SHORT ANSWER TYPE

1. Will you be able to view your reflection in the mirror in a dark room? Give reason to support your answer.
2. A book and a wooden block of a similar size are kept in front of a light source as shown in figure. Which object will give the shadow of larger size?



3. How does the word "REFLECTION" written on a white sheet of paper appear in the plane mirror when it is kept in front of it? Also why does this happen?
4. Are the images different from the shadows? Give reasons to support your answer.
5. When will the shadow of our body be larger when we stand in front of the Sun: in the afternoon or in the evening?

LONG ANSWER TYPE

1. What is light? Classify the objects on the basis of their ability to emit light with examples.
2. Explain the solar eclipse and the lunar eclipse with diagrams.
3. What is a pinhole camera? Explain its working principle and the properties of the image formed by it.
4. How can you justify that light travels in a straight line?
5. In which of the following surfaces will you get the best reflection and why?
   (i) A steel plate
   (ii) A bowl full of undisturbed water
   (iii) A plane mirror

TRUE OR FALSE

1. Lunar eclipse occurs once a month.
2. Dull surfaces also reflect light like a mirror.
3. The objects around us interact differently with light.
4. A pinhole camera can be used to get image of the Sun and brightly lit objects.
5. Images are very similar to shadows.

FILL IN THE BLANKS

1. _____ is formed when light is obstructedj by an object.
2. Book : Opaque :: Tracing Paper : _____.
3. In a plane mirror, the image is formed within _____, and not on _____ .
4. An image is a _____ of light.
5. A _____ object emits light of its own.

Answer Key

EXERCISE–I														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	C	B	D	A	B	A	D	A	B	A	D	C	C	C
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
B	B	B	B	C	C	A	A	D	D	B	C	C	B	A
31	32	33												
A	B	B												

EXERCISE – II

TRUE / FALSE

1. F 2. F 3. T 4. T 5. F

FILL IN THE BLANKS

1. Shadow 2. Translucent 3. The mirror, a screen
4. Reflection 5. Luminous

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : LIGHT, SHADOWS & REFLECTIONS)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

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