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

FUN WITH MAGNETS (EXPLORING MAGNETS)

1

Concepts

Introduction

1. types of magnet
   - 1.1 Natural Magnet
   - 1.2 Artificial Magnets
   - 1.3 Temporary Magnets
   - 1.4 Permanent Magnet
2. Static electricity
3. Magnetic poles
4. Magnetic field
5. Properties of magnet
   - 5.1 magnets exert their influence through various media
   - 5.2 the freely suspended magnet always comes to rest in the north- south direction
   - 5.3 Like poles repel, unliKe poles attract each other
   - 5.4 poles exist in pairs
6. The earth magnetism
7. Magnetic compass
8. Electromagnets
9. Electric Bell
   - 9.1 Working of an electric bell
10. Uses of magnet
11. Precautions while using magnets

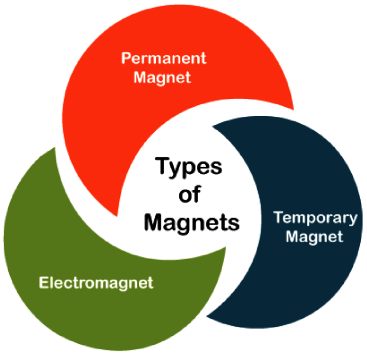
Solved Examples

NCERT Solutions

Exercise – I (Competitive Exam Pattern)

Exercise – II (Board Pattern Type)

Answer Key



INTRODUCTION

A magnet is a material which has an ability to attract objects made of metals like iron, nickel, cobalt and their alloys.

Magnet can also make some objects move or even fly through the air. A magnet can affect an object without even touching it. Some insects, birds and fishes have extremely small magnets in their bodies.

The substances having the property of attracting magnetic materials like iron are known as **Magnets**.

When you bring two magnets close together, they will either repel or attract each other. The force that pushes magnets apart or pulls them together is called **Magnetic force**. In other words magnet is any object with magnetic force.

1. TYPES OF MAGNET

There are four type of magnet

1.1 NATURAL MAGNET

Natural occuring minerals or ores having magnetic properties are called '**Natural magnets**'. Due to their irregular shapes and weak attracting power, natural magnets are rarely used now a days.

Eg. Magnetite is an ore of iron [Fe_3O_4]

1.2 ARTIFICIAL MAGNETS

Now a days pieces of iron and many other materials of suitable shapes and sizes are made as magnets. Such magnets are called **artificial magnet** e.g. Bar magnet, U-shaped magnet (horse-shoe magnet), cylindrical magnet or a ball ended magnet, magnetic compass needle, etc.

1.3 TEMPORARY MAGNETS

The magnets which cannot retain their magnetism for a long time are called temporary magnets. The temporary magnets are made from the **soft iron**.

E.g. Electromagnet

1.4 PERMANENT MAGNET

The magnets which retain their magnetism for a very long period of time are called permanent magnets. The permanent magnets are generally made from steel. More powerful permanent magnets are made from ALNICO, an alloy of Aluminium, Nickel and Cobalt or from Ferrite. The ferrite made permanent magnets are quite strong.

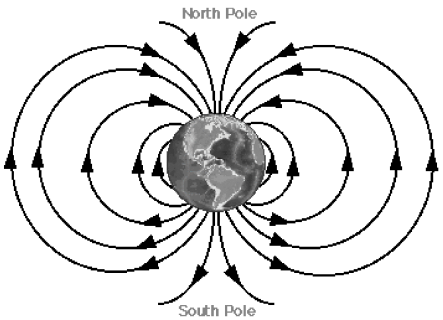


Figure : Earth as Permanent magnet

2. MAGNETIC & NON MAGNETIC MATERIALS

The materials which are affected by magnets are called magnetic materials. Those materials which are not affected by magnets are called non-magnetic materils. Iron, nickel and cobalt are magnetic materials while copper, zinc, gold and silver etc., are non-magnetic materials.

3. MAGNETIC POLES

The parts of a magnet where the magnetic force is strongest are called the **Magnetic poles**. All known magnets have two poles, a north pole and a south pole.

If iron filings (fine particles of iron) are sprinkled over a bar magnet, most of the filings stick to the two ends of the bar with very few particles sticking to the middle portion.

Figure : North pole and South pole of magnet

LAB TIME
Let's Do & Learn

Ex. Spread out some iron fillings over a sheet of paper. Now, move a bar magnet in the fillings taking care that all parts of the magnet moves through iron filling and observe how the iron fillings are distributed all over the magnet.

We will notice that most of the iron fillings cling near the ends of the magnet while there are a few iron fillings near the middle.

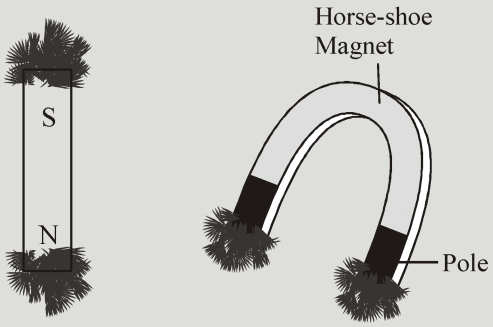


Figure : Showing strength of Magnet at poles

Repeat the experiment with a horseshoe magnet. This experiment explains the attractive property of magnets.

-What happens when a bar magnet cut in two or wore pieces

When you cut magnet in two or more pieces. you will get to normal magnet similar to original one just shorter

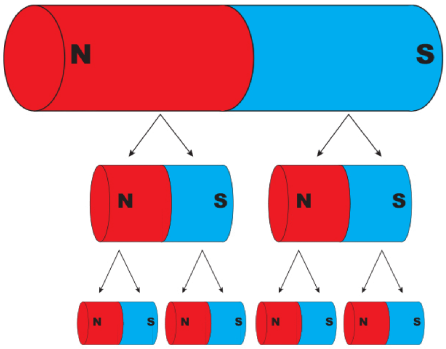


Figure : Cutting of Bar Magnet

(i) The magnetic pull seems to come from two points near the ends. These preferred regions of attraction are called the magnetic poles. We will find that all magnets have maximum attractive power at their poles. Poles of a magnet slightly inside from the end points.
Effective length : - Distance between two mangetic poles of magnet, it is slightly shorter than the physical length of the magnet.
(ii) A freely suspended magnet always align itself along the north-south direction. The end of the magnet that points towards the north is called the North pole (N-pole) and the other end of the magnet pointing towards the South is called the South-pole(S-pole).
(iii) Like poles of the magnets repel each other while unlike poles attract each other.
(iv) Magnetic poles always exist in pair.
(v) Repulsion is the surest test of magnetism. Since a magnet can attract magnetic substances and magnet also but it will always repel the magnet only.

4. MAGNETIC FIELD

A region of influence surrounding a magnet, in which other magnets or materials like iron are affected by magnetic forces is called 'Magnetic field'.

5. PROPERTIES OF MAGNET

5.1 MAGNETS EXERT THEIR INFLUENCE THROUGH VARIOUS MEDIA

The effect of magnet works through air, water and even through some solid things. An object very near to magnet experiences more force as compared to an object kept a little away. The area around magnet in which its effect can be experienced is called Magnetic field.

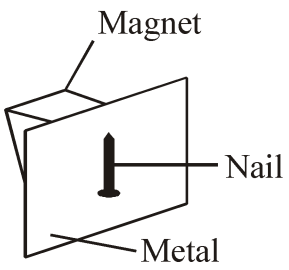


Figure : Nail experiencing magnetic field through metal

5.2 DIRECTIVE PROPERTY OF MAGNET

When a magnet is suspended freely, it aligns itself to north-south direction. The pole of the bar magnet pointing towards north direction when suspended freely is called '**north pole** (or north seeking pole)'. The pole of the bar magnet pointing towards south direction when suspended freely is called '**south pole** (or south seeking pole)'.

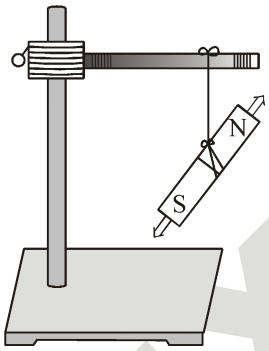


Figure : Freely suspended magnetic bar

5.3 ATTRACTIVE AND REPULSIVE PROPERTY

Two bar magnets kept on a table end to end either stick to each other with a lot of force, or it will be difficult to bring them together so that they touch each other. This is because the North pole of one magnet attracts the South pole of the other magnet. On the other hand, North pole of one magnet strongly repels the North pole of the other magnet. Thus, we can say that unlike poles attract each other and like poles repel each other.

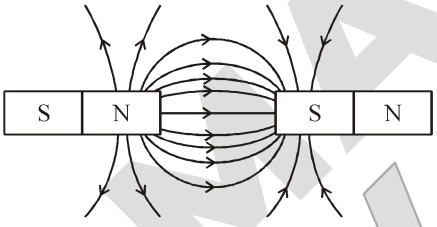


Figure : Unlike pole attraction

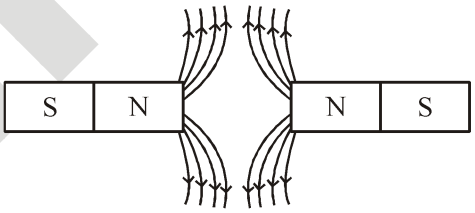


Figure : Like pole repulsion

5.4 PAIRING PROPERTY

In a bar magnet there are always two poles which are equal in strength and opposite in nature. In other words, 'a magnet is always a dipole'.

BUILD THE CONCEPT

Q. 1. Can we separate the north pole of a magnet from its south pole by breaking it from the middle ?

Ans. If we break a magnet into two parts from the middle, we cannot isolate the north and the south poles. Instead we will get with two separate magnets, each with its own north and south poles. If we further cut these two magnets, we would get four separate magnets, each with its own north and south poles (figure). This means, poles always exist in pairs, and we can never have an isolated north pole or south pole.

6. THE EARTH MAGNETISM

The earth itself behaves like a huge bar magnet with its magnetic poles near the geographical North and South poles. In a freely suspended magnet, therefore, the North pole of magnet points towards the geographical North pole since it is attracted by the earth's magnetic South pole. Similarly, the South pole of the suspended magnet is attracted by the earth's magnetic North pole and, therefore, points towards the geographical South pole.

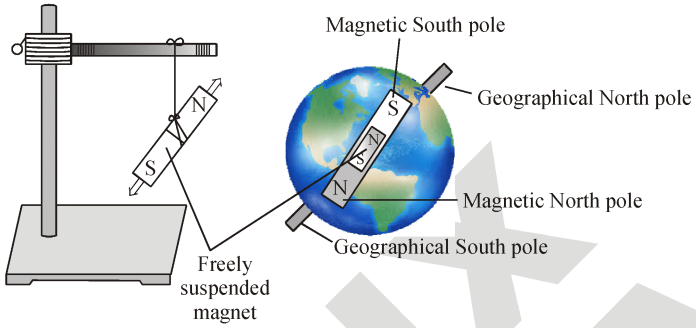


Figure : Earth Magnetism

7. MAGNETIC COMPASS

Pretend you are on a boat at night & no land is in sight, the sky is cloudy. Ancient sailors could become lost on such night until the compass was invented.

A magnetic compass needle or simply 'compass' is an instrument that uses Earth's magnetic field to help people find directions. A compass needle is actually a thin magnet. The needle points in north direction because it aligns in the direction Earth's magnetic field. Since a compass needle points towards north, the compass can be used to tell north, east, south and west and other directions in between.

Figure : Magnetic compass

8. ELECTROMAGNETS

An electromagnet is a coil of wire wrapped around an iron core. When an electric current flows through the coil, it creates a magnetic field. This produces a temporary magnetism in the iron core. This phenomena accidentally discovered by H.C Oersted. Thus, magnetism of current carrying coil and iron core together produces a strong magnetic field.

When the current stops, there is no magnetic field due to the coil and the iron core is no longer magnetic. Henc Electromagnet are called temporary magnet.

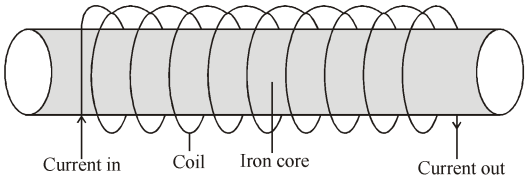


Figure : An electromagnet

An electromagnet can be switched on and off by turning the electric current on and off. Also, by changing the current & number of coil the magnetic field can be made stronger or weaker.

Advantage of electromagnet over permanent magnet

(i) An electromagnet can produce a strong magnetic field as compared to a permanent magnet.

(ii) The strength of magnetic field of an electomagnet can be changed easily by changing the current or the number of turns in the coil.

(iii) The polarity (north pole of south pole) of the electromagnet can be changed by reversing the direction of the current.

(iv) An electomagnet can be easily magnetised or demagnetised as per the requirement.

9. ELECTRIC BELL

An electric bell consists of an iron core, on which is wound a wire as a coil. One end of the coil is connected to one terminal of a battery, and the other end to a steel rod that acts like a spring for the hammer touching the screw contact. The other terminal of the battery is connected to the screw contact with a switch in the middle.

9.1 WORKING OF AN ELECTRIC BELL

Electric current flows through the coil when the switch is ON, and the iron core acts as an electromagnet. The iron core attracts the hammer towards it. The hammer hits the bell and produces a sound. The circuit breaks at the screw contact when the hammer moves towards the iron core. At this point, the iron core ceases to be an electromagnet. The hammer is pulled back to its original position due to the spring action of the steel rod, and then touches the contact again to complete the circuit. The circuit is completed and current flows through the coil again, and the hammer strikes the bell again. The process repeats itself and you hear a ringing sound since the hammer keeps hitting the bell, until the switch is released.

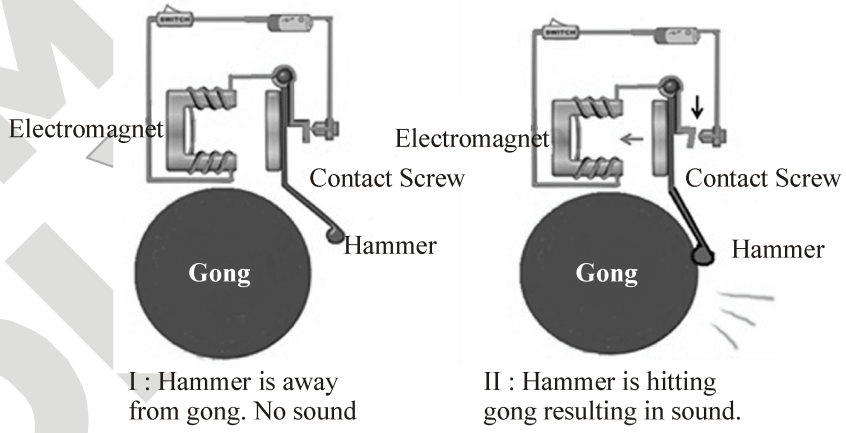


Figure : Electric bell

Focus Point

⇒ When an electric current flows through a wire, it creates a magnetic field around the wire. Increasing the current makes the magnetic field stronger. You can also make the magnetic field stronger by winding the wire into a long coil. Each loop of wire is like a little magnet that has its own magnetic force. All loops together produce a strong magnetic field.

⇒ Strength of an electromagnet increases with the increases in current. The more lightly the turns are wound stronger will be the electromagnet.

10. USES OF MAGNET

Magnets are used for a variety of purpose these days. Some of these are as follows :

(i) In electric motors, fans etc.

(ii) In self closing pencil boxes, pin holders, etc.

(iii) In fancy stickers and decorations to be fixed on refrigerators and steel almirahs.

(iv) To separate iron or magnetic substances from non-magnetic substances in industries.

(v) In credit, debit and ATM cards and in audio/video cassettes.

(vi) In bicycle and automobile dynamos for making electricity.

11. PRECAUTIONS WHILE USING MAGNETS

1. Magnets lose their properties if they are heated, hammered or dropped from a height.

2. Magnets become weak if not stored properly : Magnets should be kept in magnetic keepers. A magnetic keeper consisits of a wooden piece with two magnets on its two sides with their like poles on opposite side. Two pieces of soft iron are to be placed across their ends. However for a horse shoe magnet one piece of soft iron is sufficient.

3. Keep magnets away from cassettes, mobiles, T.V. CD's, computers as they are weakened by these devices.

SOLVED EXAMPLES

SE. 1

State three examples of each :
(a) Magnetic material
(b) Non-magnetic material

Ans. (a) Magnetic materials : iron, nickel, cobalt, etc.
(b) Non-Magnetic materials : wood, brass, paper etc.

SE. 2

Differentiate between an artificial magnet and a natural magnet.

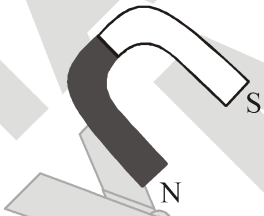
Ans. Natural magnet is a natural occuring magnetic substance found in the Earth's crust, i.e., magnetite (consists of oxides of iron). e.g., lodestone.
An artificial magnet is made by using electrical or mechanical methods. They are made by magnetic substances, i.e., iron, cobalt, nickel and their alloys. e.g., bar magnet.

SE. 3

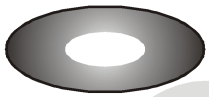
Draw the shapes of different types of artificial magnets.

Ans.

Dumbbell-shaped magnet

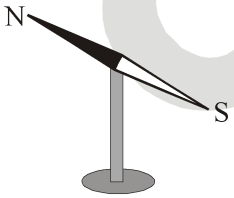


U-shaped magnet



Ring-shaped magnet

Bar Magnet



Needle-shaped magnet

SE. 4

Why does a compass needle get deflected when brought near a bar magnet ?

Ans. A compass needle gets deflected when brought near a bar magnet because the bar magnet exerts a magnetic force on the compass which is itself a tiny pivoted magnet and is free to move in the horizontal plane.

SE. 5

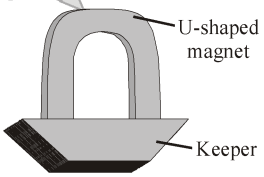
Why are magnetic keepers used to store magnets ?

Ans. Magnetic keepers are used to store magnets to prevent them from getting demagnetised.

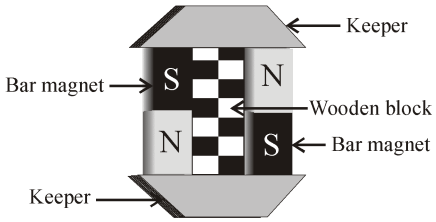
SE. 6

How can you store a U-shaped magnet and a bar magnet ?

Ans. U-shaped magnet : To prevent U-shaped magnet from demagnetisation a piece of soft iron, i.e., keeper is placed across the two poles of the U-shaped magnet.



Bar magnet : To prevent Bar magnet from demagnetisation Two keepers are placed across the poles of a pair of bar magnet and are separated by a wooden block.



SE. 7

What are the poles of a magnet ? How are they different from the other regions of a magnet ?

Ans. The two ends of a magnet are called its poles and are named as North-pole (N) and South pole (S). The magnetic strength of a magnet is greater at its poles than at any other region of the magnet. So, they are different from the other regions of the magnet.

SE. 8

How would you classify the objects as magnetic or non-magnetic if you are given with a bar magnet ?

Ans. Touch the bar magnet with the given objects and lift it up. Magnetic objects will stick to the ends of the bar magnet whereas the non-magnetic objects will remain as they are.

SE. 9

Before the invention of the compass, sailors used to find directions. Explain ?

Ans. Before the invention of the compass, sailors used stars to find directions. As the Sun rises in the east, one can easily identify the east. The west lies opposite to the east. If one stands facing the east, then, the north will be on his/her left side and the south will be on the right. During the night, one can see the Pole star in the sky which is positioned exactly above the north pole of the Earth to identify directions.

SE. 10

Encircle the odd one out. Give reason for your choice.

(i) Glass, cotton, Nickel, Copper

(ii) Magnetite, Bar magnet, Dumbbell-shaped magnet, Horseshoe magnet.

Ans. (i) Glass, Cotton, **Nickel**, Copper

Nickel is a magnetic substance whereas the others are non-magnetic.

(ii) **Magnetite**, Bar magnet, Dumbbell-shaped magnet, Horseshoe magnet.

Magnetite is an iron ore which is a natural magnet while the others are artificial magnets.

Space for Notes :

NS. 1

Fill in the blanks in the following.

(i) Artificial magnets are made in different shapes such as _____ , _____ and _____ .

(ii) The materials which are attracted towards a magnet are called _____ .

(iii) Paper is not a _____ material.

(iv) In olden days, sailors used to find direction by suspending a piece of ____ .

(v) A magnet always has _____ poles.

Ans. (i) Artificial magnets are made in different shapes such as bar magnet, horse-shoe magnet and cylindrical magnet.

(ii) The materials which are attracted towards a magnet are called magnetic materials.

(iii) Paper is not a magnetic material.

(iv) In olden days, sailors used to find direction by suspending a piece of bar magnet.

(v) A magnet always has two poles.

NS. 2

State whether the following statements are **true or false.**

(i) A cylindrical magnet has only one pole.

(ii) Artificial magnets were discovered in Greece.

(iii) Similar poles of a magnet repel each other,

(iv) Maximum iron filings stick in the middle of a bar magnet when it is brought near them.

(v) Bar magnets always point towards North-South direction. when they are freely suspended.

(vi) A compass can be used to find East-West direction at any place.

(vii) Rubber is a magnetic material.

Ans. (i) False. A magnet always has two poles independent of its shape.

(ii) False. Natural magnets were discovered in Greece.

(iii) True. Like poles repel each other while unlike poles attract each other.

(iv) False. Maximum iron filings stick at the ends of a bar magnet when it is brought near them.

(v) True, Bar magnets point towards North - South direction, when they are freely suspended.

(vi) True. A magnetic compass points towards North-South direction, if it is known, then the East-west direction can also be determined.

(vii) False. Rubber is not attracted to a magnet. So, it is not a magnetic material.

NS. 3

It was observed that a pencil sharpener gets attracted by both the poles of a magnet although its body is made of plastic. Name a material that might have been used to make some part of it.

Ans. The blade of the pencil sharpener is made of iron. Iron gets attracted by the poles of a magnet as it is a magnetic material.

NS. 4

Column I shows different positions in which one pole of a magnet is placed near that of the other. Column II indicates the resulting action between them for each situation. Fill in the blanks.

Column I	**Column II**
N - N	_____
N - ____	Atrraction
S - N	_____
_____- S	Repulsion

Ans.

Column I	**Column II**
N - N	Repulsion
N - S	Attraction
S - N	Attraction
S - S	Repulsion

NS. 5

Write any two properties of a magnet.

Ans. Two properties of a magnet are as follows :

(i) Magnets attract objects made of magnetic materials like iron.

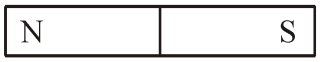
(ii) Like magnetic poles repel each other while unlike magnetic poles attract each other.

NS. 6

Where are poles of a bar magnet located ?

Ans. Pole of a bar magnet are located at both the ends of bar magnet.

North pole (N) and the South pole (S) of a bar magnet are shown in the figure.

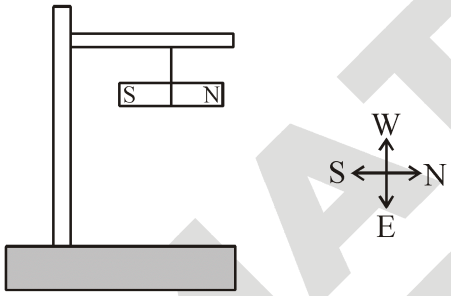


NS. 7

A bar magnet has no markings to indicate its poles. How would you find out near which end is its north pole located ?

Ans. A freely suspended bar magnet always comes to rest in the North-south direction.

The geographical North facing end of the magnet is its north pole and the geographical south facing end is its South pole.



Hence, the unknown poles of a bar magnet can be marked by suspending it freely by a string.

NS. 8

You are given an iron strip. How will you make it into a magnet ?

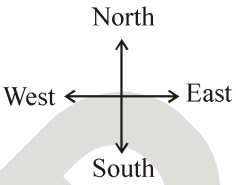
Ans. "Touch and stroke" method can be used to make an iron strip into a magnet. For this, a bar magnet is required. The bar magnet is moved along the length of the iron strip starting from one end to the other end.

Then, the bar magnet is lifted from the other end and brought to the starting point again with the same pole of the magnet. On repeating the process for about 30-40 times, the iron strip will become a bar magnet with two poles.

NS. 9

How is a compass used to find directions ?

Ans. A compass always points towards the North-South direction. The arrow of the compass needle indicates its North pole. The arrow always points in the North direction.



Compass

Once we know North direction, we can easily find out the other directions. e.g., if North is upwards, South will be downwards, East will be on right hand side and West will be on left hand side.

NS. 10

A magnet was brought from different directions towards a toy boat that has been floating in water in a tub. Affect observed in each case is stated in column I. Possible reasons for the observed affects are mentioned in column II. Match the statements given in column I with those in column II.

Column I	Column II
Boats gets attracted towards the magnet.	Boat is fitted with a magnet with North pole towards its head.
Boat is not affected by the magnet.	Boat is fitted with a magnet with South pole towards its head.
Boat moves towards the magnet if North pole of the magnet is brought near its head.	Boat has a small magnet fixed along its length.
Boat moves away from the magnet when North pole is brought near its head.	Boat is made of magnetic material.
Boat floats without changing its direction	Boat is made of non-magnetic material.

Ans.

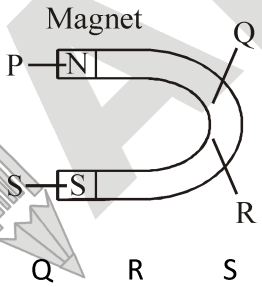
Column I	Column II
Boats gets attracted towards the magnet.	Boat is made of magnetic material.
Boat is not affected by the magnet.	Boat is made of non-magnetic material.
Boat moves towards the magnet if North pole of the magnet is brought near its head.	Boat is fitted with a magnet with South pole towards its head.
Boat moves away from the magnet when North pole is brought near its head.	Boat is fitted with a magnet with North pole towards its head.
Boat floats without changing its direction	Boat has a small magnet fixed along its length.

Space for Notes :

EXERCISE – I

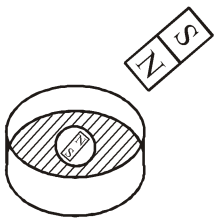
ONLY ONE CORRECT TYPE

1. The chemical formula of magnetite (natural magnet) is :
   (A) Fe_2O_3 (B) Fe_3O_4
   (C) FeO (D) FeO_2
2. The poles of the magnet always exist in
   (A) Pairs (B) Single
   (C) Both (A) & (B) (D) Can't say
3. The magnet can be demagnetized by
   (A) Hammering (B) Heating
   (C) Dropping from height (D) All of these
4. Which of the following statement is true ?
   (A) An electromagnet does not attract a piece of iron.
   (B) An electric current flowing in a circuit deflects a magnetic needle.
   (C) An electromagnet is a permanent magnet.
   (D) An electromagnet can be used to separate plastic bags from a garbage heap
5. If there are 3 bar magnets, the total number of poles will be :
   (A) 2 (B) 6
   (C) 3 (D) 4
6. Which scientist discovered that current carrying wire behave as magnet ?
   (A) Newton (B) Hans Christian Oersted
   (C) Einstein (D) Faraday
7. Coloured part of the needle of magnetic compass represents :
   (A) North (B) South
   (C) East (D) West
8. ALNICO is an example of _____magnet :
   (A) Permanent (B) Temporary
   (C) Both (A) and (B) (D) None of these
9. Electromagnet is an example of _____magnet :
   (A) Permanent (B) Temporary
   (C) Both (A) and (B) (D) None of these
10. A freely suspended magnet always align itself along the :
    (A) North-South direction
    (B) North-East direction
    (C) South-East direction
    (D) East-West direction
11. Which one of these is a temporary magnet ?
    (A) Bar magnet
    (B) Electromagnet
    (C) South-East direction
    (D) East-West direction
12. Which of the following is/are non magnetic materils
    (A) Plastic (B) Glass
    (C) Rubber (D) All of these
13. Lisa did an experiment to find out which part of the magnet attracts the most pins. Which of these reading is correct ? Number of pins attracted by the Dart of the magnet



	P	Q	R	S
(A)	8	1	2	8
(B)	8	3	3	2
(C)	3	2	3	8
(D)	1	8	8	1

14. What would happen when the magnet is held near the cork as shown in the diagram ?

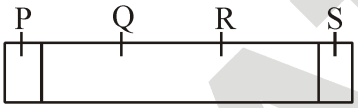


(A) The cork would move towards the magnet because of magnetic force of repulsion.
(B) The cork would move towards the magnet because of magnetic force of attraction
(C) The cork would move away from the magnet because of magnetic force of repulsion
(D) The cork would move away from the magnet because of magnetic force of attraction.

15. Needle of the compass is made of a magnet because it
(i) Attracts metal
(ii) Gets deflected when a magnet is brought near to it
(iii) Comes to rest in East-West direction
(iv) Comes to rest in a North-South direction
Which of the above statements correctly fill the blank
(A) (i) & (ii) (B) (i), (ii) & (iii)
(C) (ii) & (iv) (D) (ii) only

16. Magnets lose their properties significantly if :
(A) Left in the open
(B) Touched with iron
(C) Dropped from a height repeatedly
(D) None of these

17. Vikram is going to dip a bar magnet into a container of iron filings. Which part of the bar magnet will he observe attract the most amount of the iron filings ?



(A) P & Q (B) P & S
(C) R & S (D) P, Q & R

18. When the bar magnet moves, it is able to drag the match box along. What is most likely to be found in the matchbox ?
(A) Marble (B) Steel ball bearing
(C) Ten-rupee coin (D) Both B & C

19. In which of the following a permanent magnet is not used ?
(A) In magnetic door catches
(B) Loudspeakers
(C) In compasses
(D) None of these

20. Which of the following groups of items is needed to make an electromagnet ?
(A) An iron nail, a battery and copper wire.
(B) An iron nail, a battery and a light bulb.
(C) An iron nail, copper wire and a light bulb.
(D) None of these

21. A substance that has the property of attracting certain substances, like iron are :
(A) nickel (B) magnet
(C) repel (D) core

22. Magnet can be made weaker by :
(A) Keeping it wrapped in cotton wool
(B) Using it as a hammer
(C) Keeping it in a cool room
(D) Playing with it

23. Reeta puts two different objects in each of the following containers.
Container (i) : Copper coin and iron nail
Container (ii) : Stell nail and aluminium earring
Copper (iii) : Marble and gold coin
Copper (iv) : Nickel coin and steel nail
She can use a magnet to separate the objects in containers
(A) (i) & (ii) (B) (i), (ii) & (iii)
(C) (i), (ii) & (iv) (D) (i), (ii), (iii) & (iv)

24. You should not sotre a floppy disk near a magnet because :
(A) The magnet will rust
(B) The magnet will become weaker
(C) The information in the disk may be erased
(D) The magnet will break the disk

25. Magnets have a shape
(A) Cylindrical (B) Ball ended
(C) Horse shoe (D) All of these

PARAGRAPH TYPE

PARAGRAPH # 1

The Earth itself behaves as a magnet. The shape of the earth's magnetic field resembles that of an imaginary bar magnet of length one-fifth of earth's diameter. The axis of earth's magnetic field is incilined at an angle of about 15° with the geographical axis. The earth's magnetism is due to the magnetic effect of current with is flowing in the liquid core at the centre of the Earth. Thus, Earth is a huge electromagnet.

26. The axis of earth's magnetic field is inclined with the geographical axis at an angle of about :
(A) 5° (B) 15°
(C) 25° (D) 35°

27. The shape of the earth's magnetic field resembles that of an imaginary :
(A) U-shaped magnet
(B) Needle-shaped magnet
(C) Current-carrying circular coil
(D) Bar magnet

28. Earth is a huge electromagnet because of :
(A) Magnetic effect of current
(B) Electric effect of current
(C) Magnet buried at its centre
(D) All of these

PARAGRAPH # 2

Magnetic pole, region at each end of a magnet where the external magnetic field is strongest. A bar magnet suspended in Earth's magnetic field orients itself in a north–south direction. the north-seeking pole of such a magnet, or any similar pole, is called a north magnetic pole. The south-seeking pole, or any pole similar to it, is called a south magnetic pole. Unlike poles of different magnets attract each other; like poles repel each other.

29. A freely suspended magnet always aligns in the _____ direction.
(A) North–South
(B) North–East
(C) East–West
(D) South–West

30. What is the direction of magnetic field lines outside a magnet ?
(A) East pole to west pole
(B) West pole to east pole
(C) North pole to south pole
(D) South pole to North pole

31. At the centre of a bar, magnetism is
(A) Maximum
(B) Minimum
(C) Zero
(D) Unknown

MATCH THE COLUMN TYPE

32.

Column-I	Column-II
(a) N-S	(p) Repulsion
(b) Heating	(q) Alloy
(c) Alnico	(r) Attraction
(d) S-S	(s) Demagnetisation

(A) a–p, b–r, c–q, d–s
(B) a–q, b–s, c–p, d–r
(C) a–r, b–s, c–q, d–p
(D) a–s, b–r, c–q, d–p

33.

Column-I	Column-II
(a) Pole of magnet	(p) Magnetic material
(b) Steel	(q) Maximum magnetic strength
(c) A giant magnet	(r) Magnetism
(d) The property of magnets	(s) Core of the Earth

(A) a–p, b–q, c–r, d–s
(B) a–q, b–r, c–s, d–p
(C) a–q, b–r, c–p, d–s
(D) a–q, b–p, c–s, d–r

EXERCISE – II

VERY SHORT ANSWER TYPE

1. Name the shapes of some artificial magnets.
2. What are magnetic substances ?
3. Suggest some methods that are used for making artificial magnets.
4. Write the name of an iron ore that shows magnetic properties.
5. Define magnetic induction.
6. Name the device which is used for finding the directions and navigation.
7. Write the properties of magnetic poles.
8. What is magnetism ?
9. Classify the following substances in magnetic and non-magnetic substances :
   Aluminium, wood, paper, iron, cobalt, brass, nickel
10. Name the materials which are used to make permanent magnets.

SHORT ANSWER TYPE

1. What are the different types of magnets ? And where are the poles located ?
2. Distinguish between magnetic and non-magnetic substances.
3. What will happen if the north pole of a magnet is brought near :
   (i) the south pole of a freely suspended magnet ?
   (ii) the north pole of a freely suspended magnet ?
4. Distinguish between permanent magnet and temporary magnet.
5. How can you say that the power of a magnet is the strongest at the poles ?

LONG ANSWER TYPE

1. Suggest some ways to prevent demagnetisation of magnets.
2. Explain, why a freely suspended magnet always points in the north-south direction.
3. Describe the construction and working of a magnetic compass.
4. Describe a method of making artificial magnets.
5. What is a magnet ? Explain its basic properties.

TRUE / FALSE TYPE

1. Attraction is the sure test of a magnetism.
2. Magnetite is an artificial magnet.
3. Different magnets have different number of poles.
4. Magnets should be stores in pairs with their opposite poles lying side by side.
5. Hammering strengthens the magnetic properties.

FILL IN THE BLANKS

1. Magnets are made in different shapes such as _____ .
2. The materials which are attracted towards a magnet are called _____.
3. Paper is not a _____ material.
4. In olden days, sailors used to find direction by suspending a piece of _____.
5. A magnet always has _____ poles.

Answer Key

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

EXERCISE – II

TRUE / FALSE

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

FILL IN THE BLANKS

1. Bar magnet & Horse shoe magnet **2.** Magnetic material **3.** Magnetic

4. Bar magnet **5.** Two

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : FUN WITH MAGNETS)

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

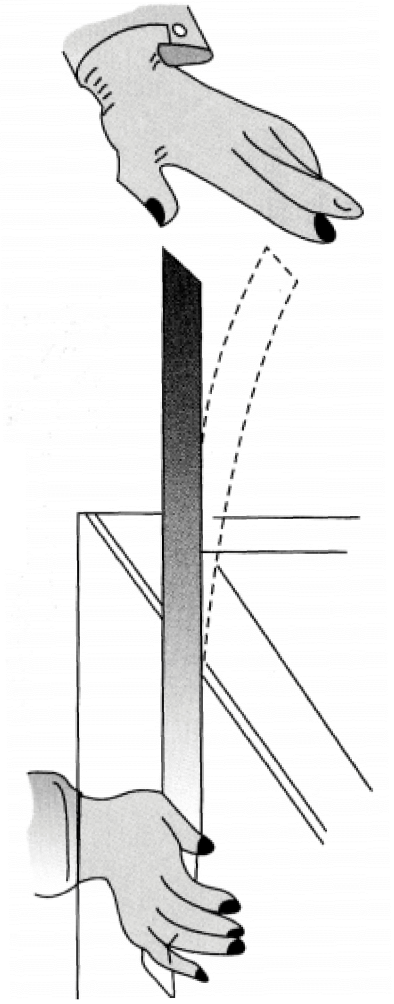
NOTES :

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 :

MOTION AND MEASUREMENT OF DISTANCES
(MEASUREMENT OF LENGTH AND MOTION)

2



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.

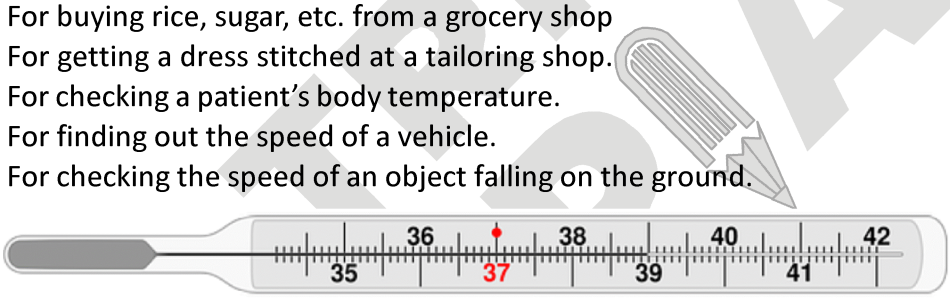


Figure : A clinical thermometer ; used to measure human body temperature

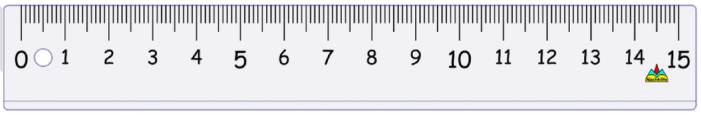


Figure : A ruler ; used to measure distances

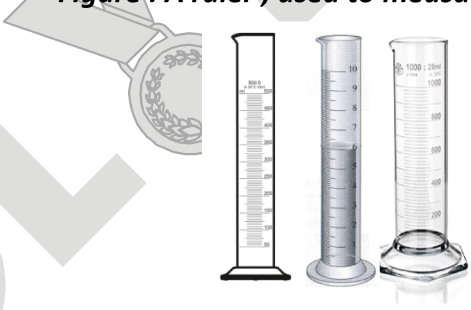


Figure : Graduated cylinder ; used to measure volume of liquids

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

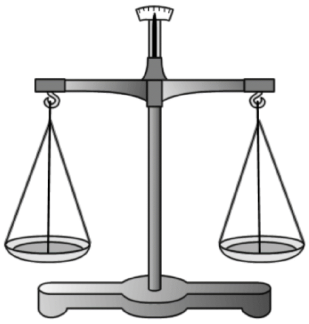


Figure : A beam balance ; used to measure mass

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)

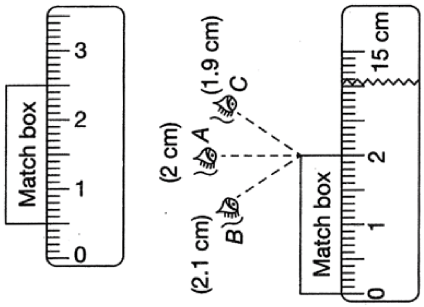


Figure : Measurement of length using ruler

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.

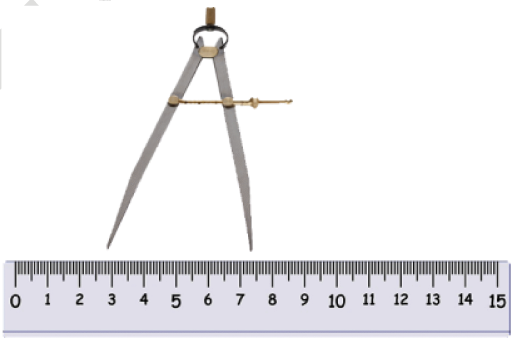


Figure : Measurement of a length using divider

Thred and Scale

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

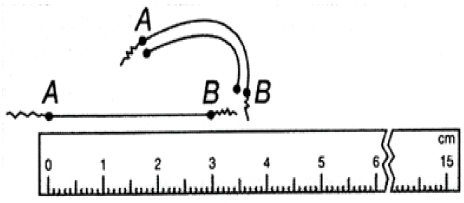


Figure : Measurement of curved length using thread

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

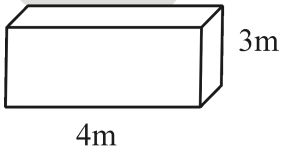
1 km^2 = 1 km × 1 km = 1000 m × 1000 m = 10^6 m^2

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

Methods of measuring area

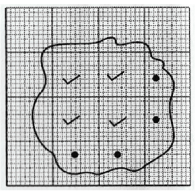
Regular surfaces → Applying formulas

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).

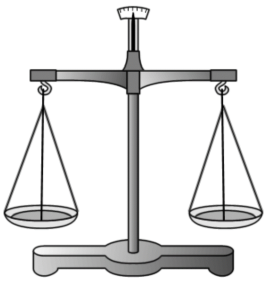


Figure : Beam balance

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

Conventional methods to measure length :

- Fathom : A measure of length corresponding to the outstretched arms,
- Cubit : A unit of linear measure equal to the length of the forearm.
- Span : The space from the thumb to the end of the little finger when extended is known as span.

7.5 MEASUREMENT OF VOLUME OR CAPACITY

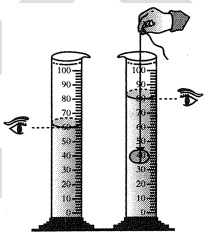
The three-dimensional space occupied by an object is known as its volume or capacity.

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.

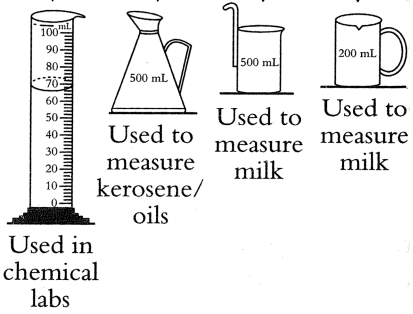
1 m^3 = 1000 L ; 'L' represents litre

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

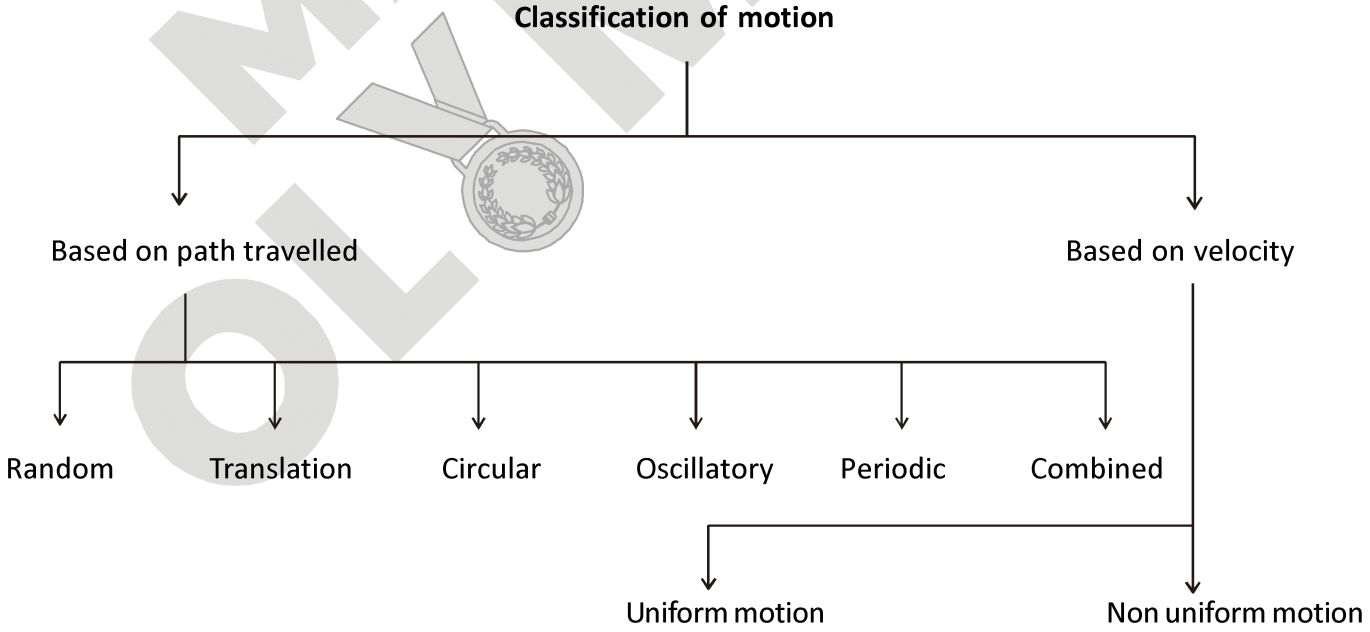
8. MOVING THINGS AROUND US

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



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

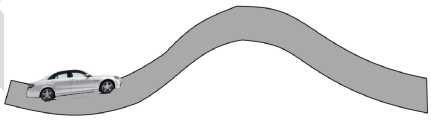


Figure : A car moving on curved path shows curvilinear motion

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.

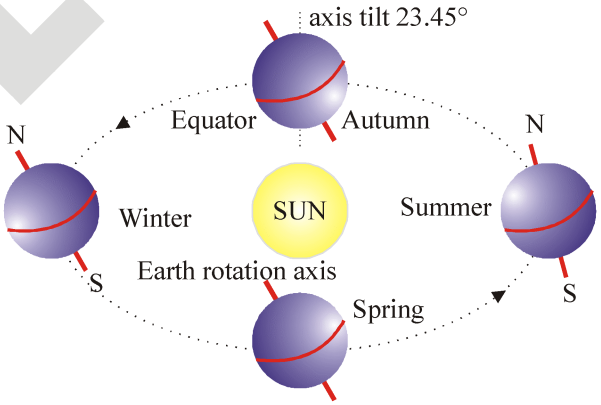


Figure : Revolution of earth around the sun

(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.

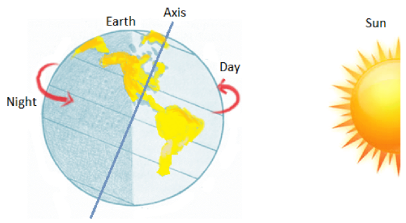


Figure : Rotation of the earth on its axis

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

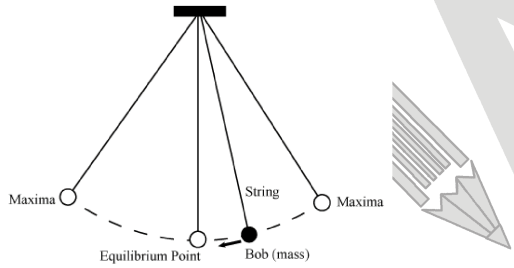


Figure : Oscillatory motion of a Pendulum

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, woo den 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.

NS. 1

Give two examples each of modes of transport used on land, water and air.

Ans. Modes of transport used on land:
(i) Car (ii) Bus
Modes of transport used on water:
(i) Ships (ii) Motorboats
Modes of transport used in air:
(i) Aeroplane (ii) Spacecraft

NS. 2

Fill in the blanks.
(i) One metre is _____cm.
(ii) Five kilometre is _____ m.
(iii) Motion of a child on a swing is _____
(iv) Motion of the needle of a sewing machine is _____
(v) Motion of wheel of a bicycle is_____.

Ans. (i) One metre is 100 cm.
(ii) Five kilometre is 5000 m.
(iii) Motion of a child on a swing is periodic.
(iv) Motion of the needle of a sewing machine is periodic.
(v) Motion of wheel of a bicycle is Rotatory.

NS. 3

Why can a pace or a footstep not be used as a standard unit of length ?

Ans. A pace or a footstep cannot be used as a standard unit of length because everyone's body parts could be of slightly different sizes. So, measure of same length made by different people will be different.

NS. 4

Arrange the following lengths in their increasing magnitude.
1 metre, 1 centimetre, 1 kilometre, 1 millimetre.

Ans. 1 millimetre < 1 centimetre < 1 metre < 1 kilometre.

NS. 5

The height of a person is 1.65 m. Express it into cm and mm.

Ans. As we know, 1 m = 100 cm
So, 1.65 m = 1.65 × 100 cm = 165 cm
Similarly, 1 cm = 10 mm
So, 165 cm = 165 × 10 mm = 1650 mm

NS. 6

The distance between Radha's home and her school is 3250 m. Express this distance into km.

Ans. Distance between Radha's home and her school = 3250 m
We know,
1 km = 1000 m
So, $1m = \frac{1}{1000}$ km

Thus, 3250 m = $\frac{3250}{1000}$ km = 3.250 km

NS. 7

While measuring the length of a knitting needle, the reading of the scale at one end is 3.0 cm and at the other end is 33.1 cm. What is the length of the needle?

Ans. Reading of the scale at one end = 3.0 cm
Reading of the scale at the other end = 33.1 cm
Length of the needle = (final reading – initial reading)
= (33.1 - 3.0) cm = 30.1 cm

NS. 8

Write the similarities and differences between the motion of a bicycle and a ceiling fan that has been switched on.

Ans. Similarities between the motion of a bicycle and a ceiling fan:
(i) Blades of fan and tyres of bicycle, both are rotating.
(ii) Both are examples of periodic motion.
Difference between the motion of a bicycle and a ceiling fan:
Ceiling fan is undergoing rotational motion while bicycle is undergoing rectilinear as well as rotational motion.

NS. 9

Why could you not use an elastic measuring tape to measure distance? What would be some of the problems you would meet in telling someone about a distance you measured with an elastic tape?

Ans. Length of an elastic measuring tape can vary on stretching. So, it could not be used to measure distance. Some of the problems we would meet while measuring with an elastic tape are as follows:

(i) On measuring the length of an object twice, using an elastic tape, we may get different values of the same length.

(ii) Measurements will not be accurate.

NS. 10

Give two examples of periodic motion.

Ans. Examples of periodic motion :

(i) Pendulum clock

(ii) Guitar string

Space for Notes :

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 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

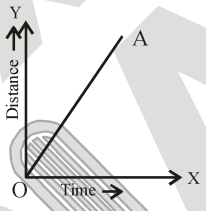
27. If the distance travelled by an object in 5 seconds is 25 m, then its speed will be :
(A) 50 m/s (B) 5 m/s
(C) 5 km/h (D) 50 km/h

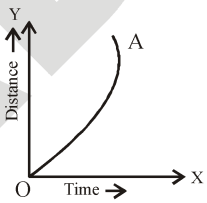
28. If an object is moving with speed (s) in time (t), then, the distance (d) will be :
(A) $d = s \times t$ (B) $d = \frac{s}{t}$
(C) $d = \frac{t}{s}$ (D) None of these

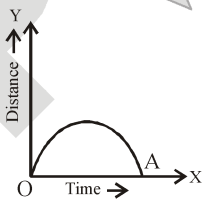
PARAGRAPH # 2

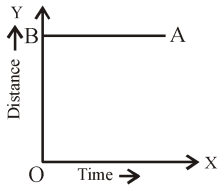
A body is said to be in motion when its position changes continuously with respect to a stationary object taken as reference point. A body has a uniform motion if it travels equal distance in equal intervals of time, no matter how small these time intervals may be. The distance-time graph for uniform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

Space for Notes :

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 mm or 2×10^8 mm

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 MEASURE OF DISTANCES)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
NCERT Exercises			
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 :