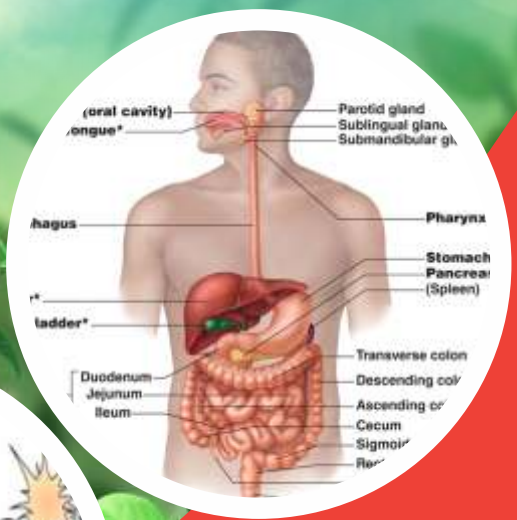
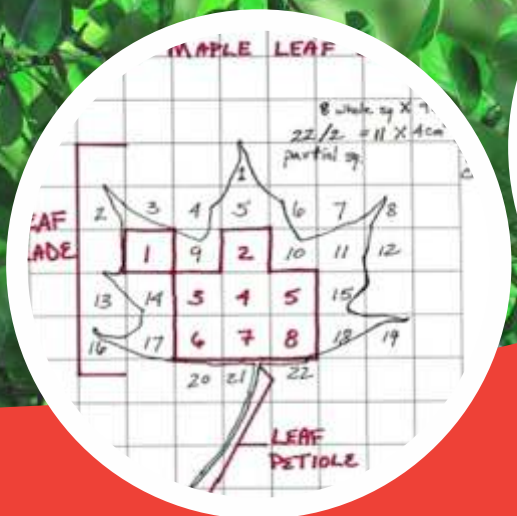
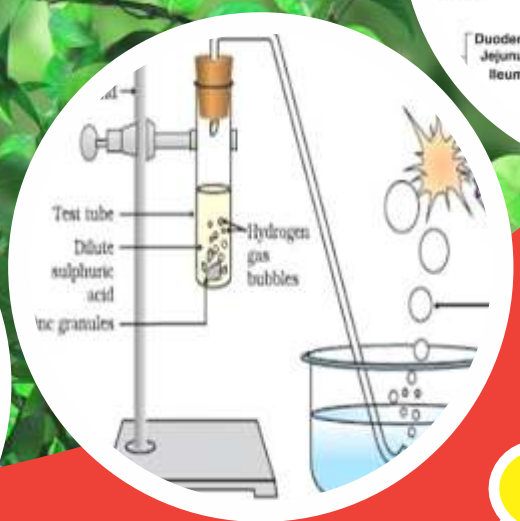
SCIENCE LAB MANUAL







VII

SCIENCE LAB MANUAL

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Name .....

School .....

Class ..... Section .....

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Preface

The quality of practical work varies considerably but there is strong evidence, from this country and elsewhere, that: When well-planned and effectively implemented, science education laboratory and simulation experiences situate students' learning in varying levels of inquiry requiring students to be both mentally and physically engaged in ways that are not possible in other science education experiences. (Lunetta et al. 2007, p.405).

The importance and relevance of exercising practical work in science is widely accepted. The qualitative practical work not only promotes the engagement and interest of students but also enriches skills, experiences, knowledge and conceptual understanding of the students. In this book, we have focused on core activities, directly related activities and complementary activities.

Furthermore, to make optimum use of this practical book, Teacher should strive for making students

1. to find problems and their solutions;
2. to develop analytical and critical attitude;
3. to find new facts and arriving at new principles.

This book is designed for to provide practical knowledge as much as possible. Through the development of the project we had a great experience of various strategies that can be applied in the development of the project. This project will prove stepping stone for our carrier.

To provide proper and essential information has been guiding principle for us, As a teacher, we endeavored to achieve this important objective. We are pleased to present this project.

Salient features of this book are: --

1. A special care has been taken to present the subject matter in simple language so that student may understand it with ease.
2. Great efforts have been made to make the book free of mistakes.
3. Original diagrams are used to clarify the experiments.
4. Multiple choice question and viva voice questions have been given in experiments.

We are greatly thankful to Shri RAVI JI (SAH Sangathanmantri, Vidya bharti, Haryana) who inspired us to write this book.

AUTHORS

Contents

INDIAN SCIENTIST

Science is an important part of our everyday life, even more so than we notice. From our fancy gadgets to the technologies we can't live without, from our humble light bulb to the space explorations, it is all gift of science and technology.

I wonder what would we be doing if none of these things were invented? How often do we take out the time to think about those extra ordinary minds who made life easier for us?

C. V. Raman

Chandrasekhara Venkata Raman won the Nobel Prize for Physics in 1930 for his pioneering work on scattering of light. Born in Tiruchirapalli on November 7, 1888, he was the first Asian and first non-White to receive any Nobel Prize in the sciences. Raman also worked on the acoustics of musical instruments. He was the first to investigate the harmonic nature of the sound of the Indian drums such as the tabla and the mridangam.

He discovered that, when light traverses a transparent material, some of the deflected light changes in wavelength. This phenomenon is now called the Raman scattering and is the result of the Raman effect.

In October 1970, he collapsed in his laboratory. He was moved to a hospital and the doctors gave him four hours to live. He survived and after a few days refused to stay in the hospital as he preferred to die in the gardens of his Institute (the Raman Research Institute in Bangalore) surrounded by his flowers. He died of natural causes on 21 November 1970.

Born on October 30, 1909 in Bombay, **Homi Jehangir Bhabha** played an important role in the Quantum Theory.


Homi Jahangir Bhabha

He was the first person to become the Chairman of the Atomic Energy Commission of India. Having started his scientific career in nuclear physics from Great Britain, Bhabha returned to India and played a key role in convincing the Congress Party's senior leaders, most notably Jawaharlal Nehru, to start the ambitious nuclear programme.

Bhabha is generally acknowledged as the father of Indian nuclear power. But few people know that he was absolutely against India manufacturing atomic bombs, even if the country had enough resources to do so. Instead he suggested that the production of an atomic reactor should be used to lessen India's misery and poverty.

He died when Air India Flight 101 crashed near Mont Blanc on 24 January 1966. Many possible theories of the crash came up including a conspiracy theory in which the Central Intelligence Agency (CIA) is involved in order to paralyze India's nuclear program.

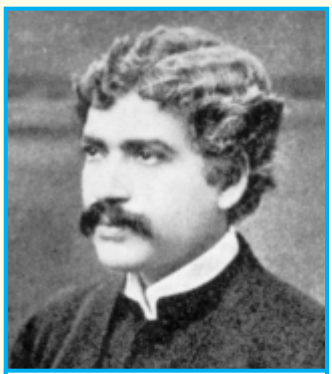

Satyendra Nath Bose

Born on January 1, 1894 in Calcutta, **SN Bose** was an Indian physicist specialising in quantum mechanics. He is of course most remembered for his role played in the class of particles 'bosons', which were named after him by Paul Dirac to commemorate his work in the field.

Bose adapted a lecture at the University of Dhaka on the theory of radiation and the ultraviolet catastrophe into a short article called “Planck's Law and the Hypothesis of Light Quanta” and sent it to Albert Einstein. Einstein agreed with him, translated Bose's paper “Planck's Law and Hypothesis of Light Quanta” into German, and had it published in Zeitschrift für Physik under Bose's name, in

1924. This formed the basis of the Bose-Einstein Statistics. In 1937, Rabindranath Tagore dedicated his only book on science, Visva–Parichay, to

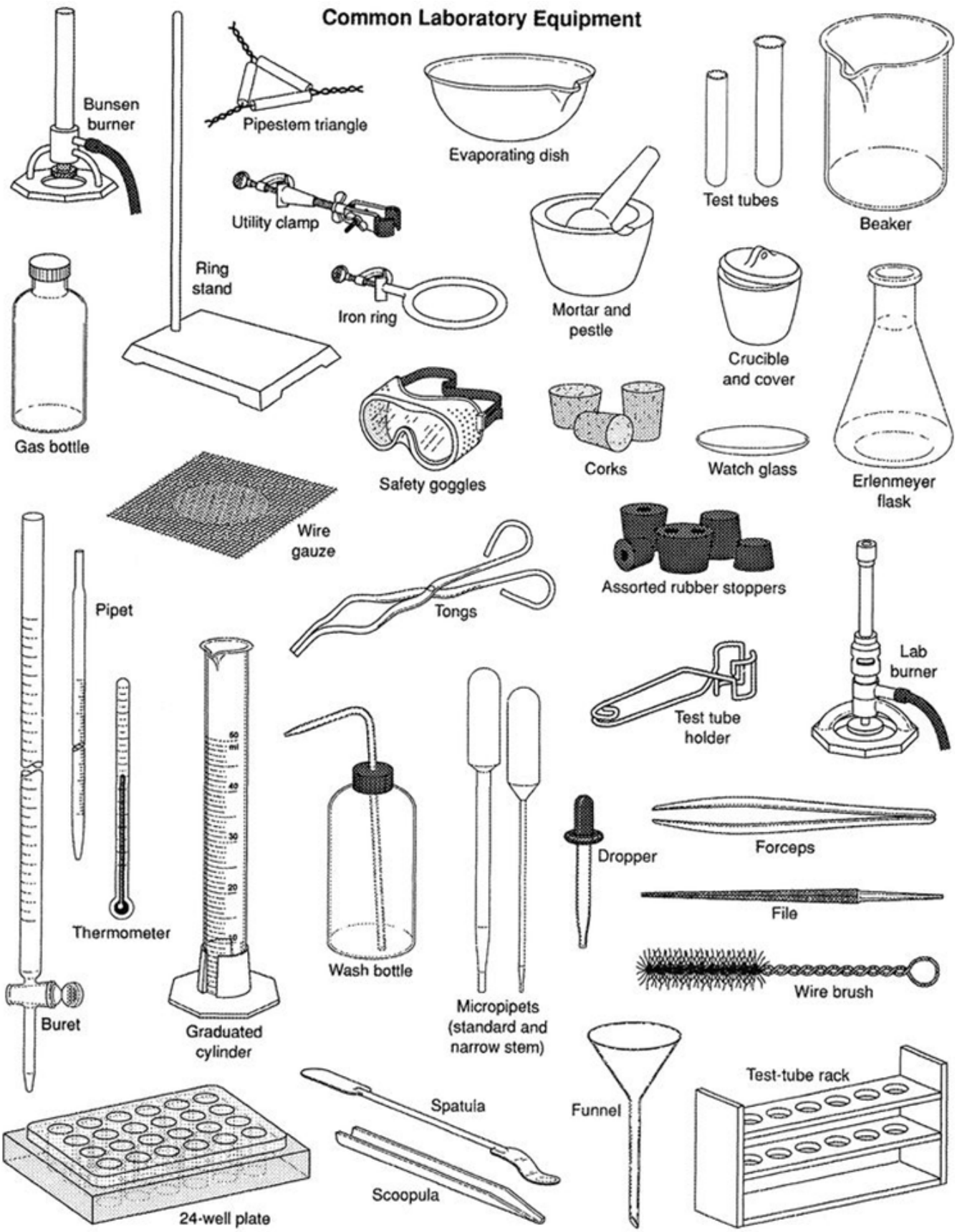
Satyendra Nath Bose. The Government of India awarded him India's second highest civilian award,


Jagdish Chandra Bose

Acharya J.C. Bose was a man of many talents. Born on 30 November, 1858 in Bikrampur, West Bengal, he was a polymath, physicist, biologist, botanist and archaeologist. He pioneered the study of radio and microwave optics, made important contributions to the study of plants and laid the foundation of experimental science in the Indian sub-continent. He was the first person to use semiconductor junctions to detect radio signals, thus demonstrating wireless communication for the first time.
What's more, he is also probably the father of open technology, as he made his inventions and work freely available for others to further develop. His reluctance for patenting his work is legendary.

Another of his well known inventions is the crescograph, through which he measured plant response to various stimuli and hypothesized that plants can feel pain, understand affection etc. While most of us are aware of his scientific prowess, we might not be aware of his talent as an early writer of science fiction! He is in fact considered the father of Bengali science fiction.

Common Laboratory Equipment



laboratory equipment

PHYSICS

Experiment 1

AIM

To measure the diameter of a ball.

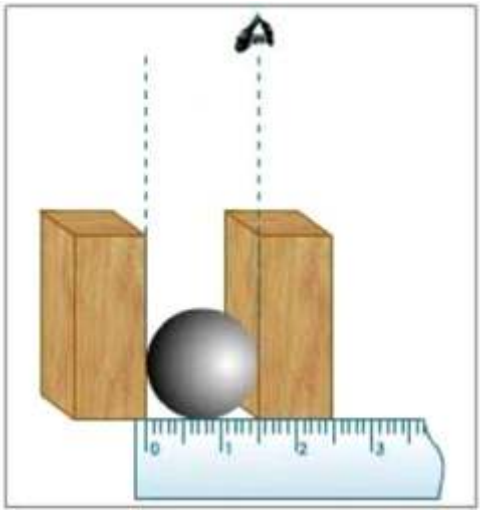
MATERIALS REQUIRED

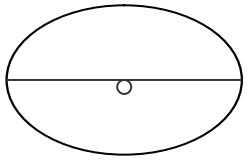
(i)Two wooden blocks. (ii) Metre scale. (iii) Ball.(iv) Table.

THEORY

The diameter of a ball or circle is the length of the line passing through the centre and touching two points on its edges.

DIAGRAM





Diameter can be calculated with help of the given radius
Diameter = 2 x radius of a ball or circle.

PROCEDURE

1. Take two wooden blocks and meter scale.
2. Place a ball on the table .
3. Place the wooden blocks such that both of these touch the ball and their upper edges are along the metre scale.
4. Measure the distance between the faces of the block by touching the ball.

Observation Diameter of ball is ……cm.

CONCLUSION

The diameter of a ball is the length of the line passing through its centre and touching two points on its edges.

VIVA QUESTIONS

Q1. What is measurement?

Ans. Measurement is the technique developed for correct judgement of dimension of various objects.

Q2. What is the formula for radius of the cylinder?

Ans. r = d/2

Q3. Calculate the radius of ball having diameter 42 cm.

Ans. r=d/2.

r= 42/2= 21 cm.

Q4. Can you measure the length of a pencil with metre scale?

Ans. Yes.

Q5. What is diameter of a ball?

Ans. The diameter of a ball is the length of the line through the centre and touching two points on the edges.

Q6. What is the formula of diameter ?

Ans. Diameter =2xradius of a ball or circle .

Q7. Write the uses of meter ?

Ans. Meter can be used as unit to measure the length of a room, Height of a tree, Diameter of ball etc.

Q8. Name the S.I. unit of length.

Ans. Meter (m)

Q9. Which unit should be used to express thickness of coin?

Ans. Millimeters. (1 mm = 10^{-3} m.)

Q10. Is it possible to measure the diameter of a ball directly using meter scale and why ?

Ans. Not possible. Because the ball is spherical in shape.

Experiment-2

AIM

To determine the volume of an irregular shape.

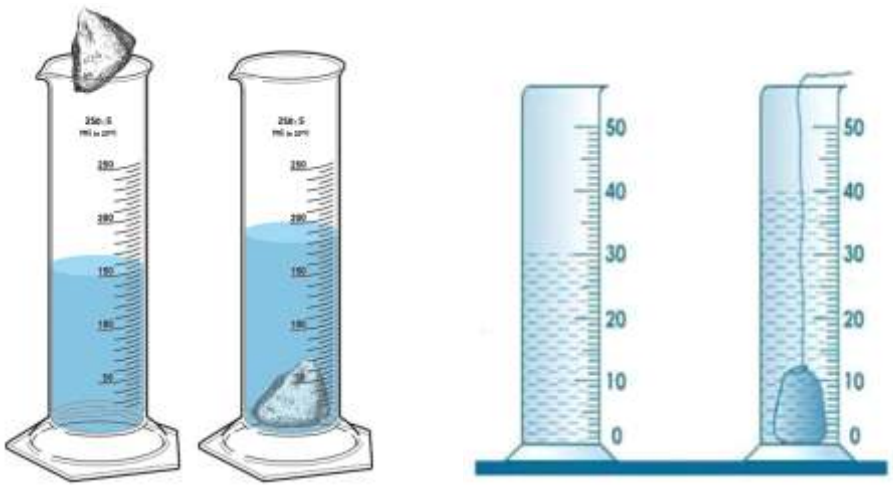
MATERIALS REQUIRED

(i) Measuring cylinder. (ii) stone (iii) thread.

THEORY

When an object is immersed in water. Water is displaced. The volume of the water displaced can also can then be measured. The volume of the immersed object will be exactly equal to the volume of the displaced water.

DIAGRAM



PROCEDURE

1. Put some water in measuring cylinder (say 50 ml.)
2. Tie the thread around the irregular shaped body.
3. Immerse the solid in water.
4. The level of water in the cylinder rises.
5. Note the new level of in the cylinder.

OBSERVATION

Volume of water taken initially = x cm^2

Volume of water after putting irregular solid = y cm^2

Volume of irregular shape body.

V = (y –x) cm^2

So, increase in the level of water is equal in the volume of irregular body.

CONCLUSION

Volume of an irregular shaped body is equal to the volume of water displaced by the body.

VIVA QUESTIONS

Q1. Define volume.

Ans. The amount of space that a given quantity of any substace will occupy is called volume.

Q2. What is the S.I unit of volume?

Ans. S.I unit of volume is cubic metre (m^3).

Q3. Complete the following :

$1\ m^3$ =……cm^3

1 litre = ……ml.

Ans. $1\ m^3$=10,00,000 cm^3

1 litre = 1000 ml.

Q4. How will you find the volume of regular solid ?

Ans. Volume of regular solid is determined by measuring its dimension.

Q5. How will you express the volume of liquid ?

Ans. Volume of liquid is expressed in litres .

Q6. Name the commonly used submultiple of a litre.

Ans. Milliliter (ml).

Experiment-3

AIM

To measure the area of irregular surface.

MATERIAL REQUIRED

(i) graph paper (ii) leaf (iii) pencil.

THEORY

Area : area is a quantity expressing the two – dimensional size of a defined part of surface.

Area= length x breadth

It's unit is cm^2

PROCEDURE

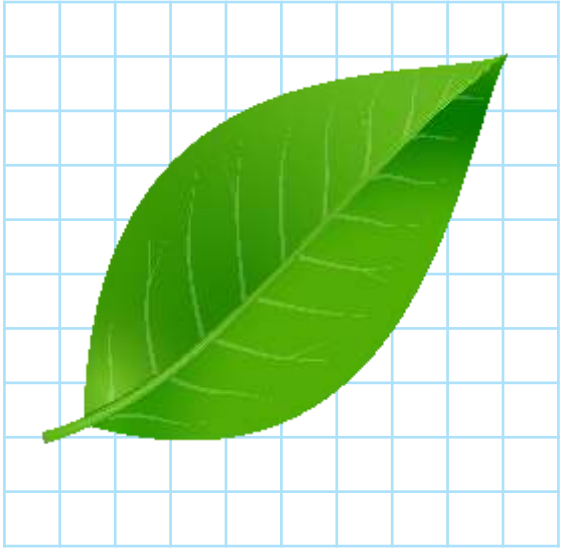
1. Place the given leaf on the graph paper.
2. Draw the boundary of the leaf with the pencil.
3. Remove the leaf.
4. Now count the number of complete small squares inside the outline.
5. Now count square which are more than half inside the outline.
6. Those squares which are less than half and inside the outline should be counted.

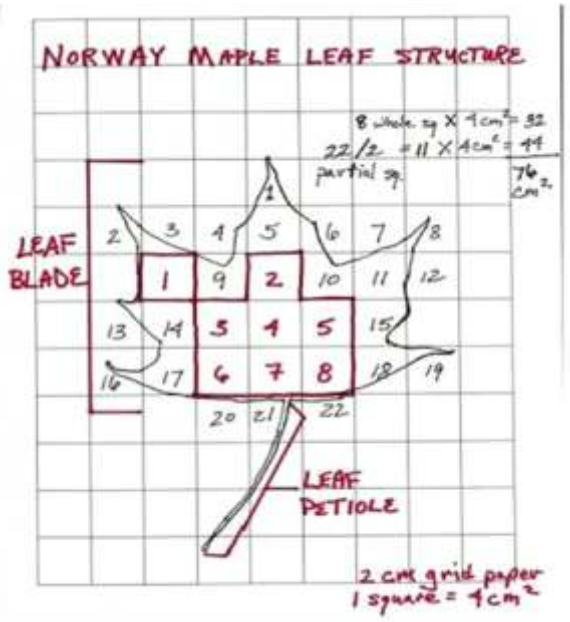
OBSERVATION

Area of the leaf = total number of complete squares + total number of squares which are either half or more than half

= ……. Sq. mm

DIAGRAM





CONCLUSION

Area of irregular surface can be measured by counting the number of square on the graph covered by the object.

VIVA QUESTIONS

Q1. What is area?

Ans. The surface occupied by an object is called area.

Q2. What is the S.I unit of area?

Ans. S.I unit of area is m^2.

Q3. Complete the following :

(i)1 km^2= ……m^2 (ii) 1m^2= ……..mm^2 (iii)1 hectare =……..m^2.

Ans. (i) 1km^2= 10,00,000 m^2 (ii)1m^2 = 10,00,000 mm^2 (iii)1 hectare= 10,000 m^2

Q4. How will you find the area of irregular surface ?

Ans. Area of irregular surface is measured by using graph paper.

Q5. What is the area of rectangle?

Ans. Area of rectangle = length x breadth.

Q6. Name any two things with irregular surface.

Ans. Leaf , foot.

Q7. What is the system used for measurements now a days?

Ans. S.I system.

Q8. What is measurement?

Ans. Measurement is the technique developed for correct judgement of dimensions of various objects.

Q9. Is the unit of area is cm^2?

Ans. No.

Q10. How many dimensions are used in area ?

Ans. Two.