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PREFACE

Physics has played a major role in the development of science and technology during the years. It covers a wide range of phenomena, from the smallest sub-atomic particles to the largest galaxies. It is the study of matter and energy and the interaction between them. Practical physics has applications in the fields of engineering, medicine, technology etc. In practical physics the student obtain laboratory skills, design experiments and apply instrumentation such as electronic circuits to observe and measure natural phenomena.

To master the science of physics practical one needs to have a complete and thorough knowledge of all the experiments involved. Hence we bring to you **"Std. XI Sci. : PHYSICS PRACTICAL HANDBOOK"** which covers all the experiments of Std XI. This handbook is writtern according to the syllabus. It includes different sets of experiments with proper steps and neat and labelled diagrams. These experiments help the student to understand the practical applications of many principles and laws involved in Std. XI. The handbook also includes all the useful tables given at the end.

And lastly, we would like to thank all those who have helped us in preparing this book. There is always room for improvement and hence we welcome all suggestions and regret any errors that may have occurred in the making of this book.

A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants!

Your's faithfully

Publisher

SYLLABUS

1. Use of Vernier Callipers.
2. Use of Screw gauge.
3. To determine radius of curvature of a given spherical surface by a spherometer.
4. To find the weight of a given body using parallelogram law of vectors.
5. To study the relationship between force of limiting friction and normal reaction and to find co-efficient of friction between a block and horizontal surface.
6. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
7. To find the value of 'v' for different values of 'u' in case of a concave mirror and to find the focal length.
8. To find the focal length of a convex lens by plotting graphs between 'u' and 'v' or between '1/u' and '1/v'.
9. To find the focal length of a convex mirror, using a convex lens.
10. To find the focal length of a concave lens, using a convex lens.
11. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
12. To determine refractive index of a glass using a travelling microscope.
13. To find refractive index of a liquid by using (i) concave mirror, (ii) convex lens and plane mirror.
14. To determine specific heat capacity of a given (i) liquid (ii) solid, by method of mixtures.

List of Activities

1. To make a paper scale of given least count, e.g. 0.2 cm, 0.5 cm.
2. To determine mass of a given body using a meter scale by principle of moments.
3. To plot a graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on horizontal plane.
5. To study the variation in range of a jet of water with angle of projection.
6. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
7. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
8. To study the nature and size of image formed by (i) convex lens (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
9. To obatin a lens combination with the specified focal length by using two lenses from the given set of lenses.
10. To note the change in level of liquid in a container on heating and interpret the observations.

GENERAL INSTRUCTIONS

1. Before performing the experiment read the experiment at home carefully and take out the points on which you want the clarification from the teacher.
2. Before actually performing an experiment student should know clearly what do determine and by which method.
3. The necessary theory to know the limitations of the method and approximations used in formula should be read.
4. The working table must be clean and apparatus should be placed in such a manner that the part which are to be read or adjusted lie at convenient distance to make the observations.
5. The apparatus must be handled with great care.
6. Read all the precautions before performing the experiment.
7. Before writing down any final observation, take some trial readings and find out the range you are going to cover. Divide the range into equal parts according to the number of readings you are going to take.
8. Since all the measurements are affected by errors of observations repeat your observations at least three times for the same quantity and take the mean value. Sometimes it happens that one of the observed values differs widely from the rest. Reject that value.
9. The proper units to the measured quantity, should be written.
10. Writing of observations on loose sheets should be strictly avoided. The observations should be recorded in the practical note book. There should be no over writing.
11. Always bring compass box, sharpened pencil, eraser, hand book in the Laboratory.
12. Calculations for all observations neatly and with the help of logarithmic tables. Write the result with the proper units.

01 USE OF VERNIER CALLIPERS

EXPERIMENT

Aim:

i. To find the volume of a sphere and

ii. To find volume of a hollow cylinder, by using vernier callipers.

Apparatus:

Vernier callipers, sphere, hollow cylinder.

Diagram:

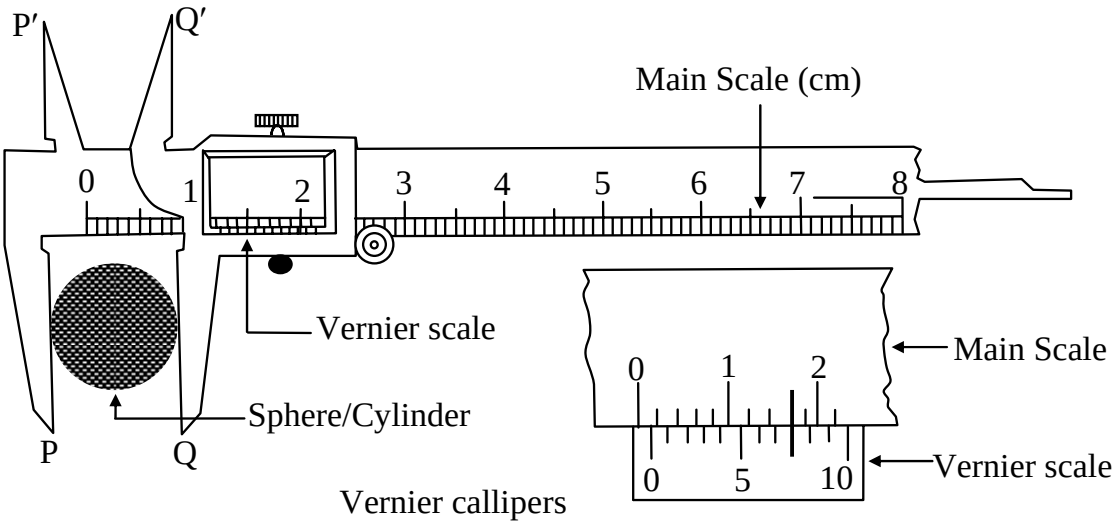

Diagram - 1

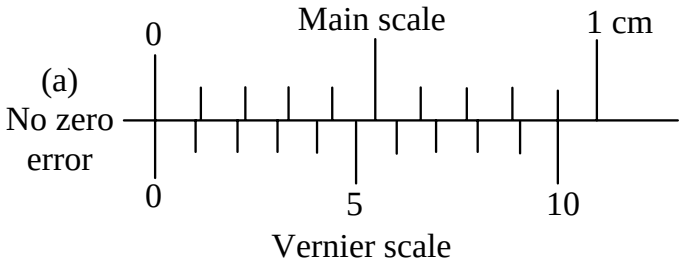

Diagram - 2

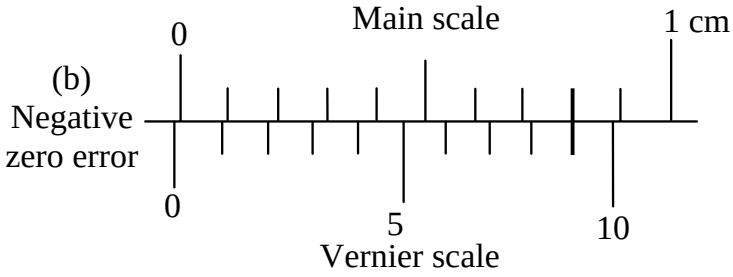

Diagram - 3

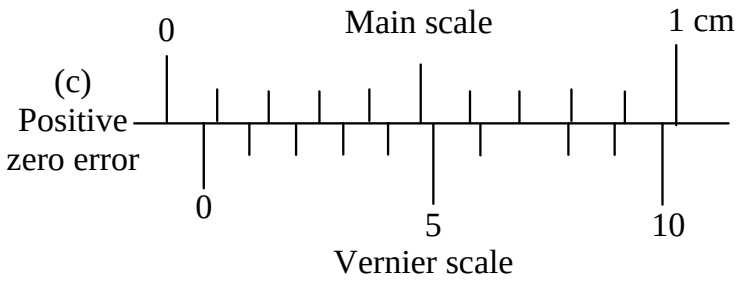

Diagram - 4

Formula:

i. Volume of a sphere = $\frac{4}{3}\pi r^3$

Where 'r' is radius of sphere

ii. Volume of cylinder = $\pi R^2 h$

Where 'R' is radius of cylinder and 'h' is height of cylinder.

Procedure:

i. Note down the value of one division of main scale (X) and number of divisions on vernier scale (N). Hence find out least count of vernier callipers (See diagram - 1).

ii. Find zero error of vernier callipers (See diagrams 2, 3, 4).

iii. To measure the diameter and hence radius of sphere, place the given sphere between the two jaws of the vernier callipers. Care should be taken that undue pressure on the sphere is avoided.

iv. Observe the zero of the vernier scale. It lies between two successive readings of the main scale. The lesser reading is the main scale reading (M.S.R.) 'a'

v. Now count the division of vernier scale which coincides with any of the division of main scale. This coinciding division of vernier scale is vernier scale division (V.S.D.) 'n'. Multiply 'n' by least count of vernier callipers to obtain the value of vernier scale reading. This is 'b' and it is $b = n \times$ least count.

vi. The total reading is the sum of main scale reading 'a' and vernier scale reading 'b'. This total reading gives the diameter of the sphere.

vii. Repeat the procedure (iv) to (vi) five times by rotating the sphere to get diameter at different places. Hence mean diameter and radius can be found out.

viii. Place the cylinder between the two jaws of the vernier callipers. Repeat the procedure (iv) to (vii). Find out inner diameter and hence radius of the cylinder.

ix. Measure the height of the cylinder by meter scale.

x. Apply zero correction due to zero error for every reading.

Observations:

i. Value of the smallest division on main scale (X) = …….. cm

ii. Number of divisions on vernier scale (N) = …… div

Least count of vernier callipers, L.C. = $\frac{X}{N}$ = …….

iii. Height of the cylinder = ……. cm

Observation table:

Object	Obs. No.	M.S.R. 'a' (cm)	V.S.D. n (div.)	V.S.R. b = n × L.C. (cm)	Total reading (a + b) (cm)	Corrected reading (cm)
Sphere	1.					
	2.					
	3.					
	4.					
	5.					
Cylinder	1.					
	2.					
	3.					
	4.					
	5.					

Calculations:

i. Corrected mean diameter of sphere = d = ……. cm

∴ Radius of sphere = r = $\frac{d}{2}$ = ……. cm

ii. Corrected mean inner diameter of cylinder = D = ……. cm

∴ Radius of cylinder = R = $\frac{D}{2}$ = ……. cm

iii. Volume of sphere = V = $\frac{4}{3}\pi r^3$ = …… cm^3

iv. Volume of cylinder = V′ = $\pi R^2 h$ = …… cm^3

Result:

i. Volume of sphere = …….. cm^3

ii. Volume of cylinder = …….. cm^3

Precautions:

i. While holding object in the jaws, do not exert undue pressure on it. The jaws should just touch the object.

ii. Take number of readings at different positions of the sphere as well as cylinder.

iii. The upper jaws should just touch the inner diameter of hollow cylinder.

iv. The coinciding division of vernier scale should be taken accurately, if required magnifying glass can be used.

Space for calculation: