# VERNIER CALIPERS

**AIM:**

To measure the diameter of a small spherical body using vernier callipers and find its volume.

**APPARATUS:**

Vernier calliper, Spherical body, Magnifying glass

**THEORY:**

The least measurement that can be taken by an instrument is called Least Count (LC)

$$\text{Least Count} = \frac{magnitude\ of\ one\ main\ scale\ division}{No.of\ divisions\ on\ Vernier\ scale} == \frac{1\ MSD}{N}$$

The measured value in vernier callipers is given by,

Total reading = MSR + (VSR * LC)

MSR = Main Scale Reading (The reading of the main scale just before the zero of vernier scale is taken as MSR)

VSR = Vernier Scale Reading (The vernier scale division which coincides with any of the main scale division is taken as VSR)

$$\text{Volume of sphere} = \frac{4\Pi r^3}{3}$$

**PROCEDURE:**

1. Determine the least count of vernier calipers.
2. Open the jaws of vernier calipers by loosening the screws and hold the given sphere between the jaws in a gentle way.Do not apply too much pressure on jaws.

3. Gently tighten the screw to clamp the instrument in this position.
4. Record the reading on main scale just before the zero of the vernier scale.Let us assume it as 'N' cm
5. Look for the number of divisions on the vernier scale which is coinciding with division on the main scale.Let us assume this as 'n' division.
6. Repeat these steps for about 5 times to obtain the diameter of the sphere at different positions.
7. Record your observation and calculate the mean to get the diameter of the sphere.

**RESULT:**

1. The diameter of given sphere=.....m

2. Volume of the given spherical body=.....$m^3$.

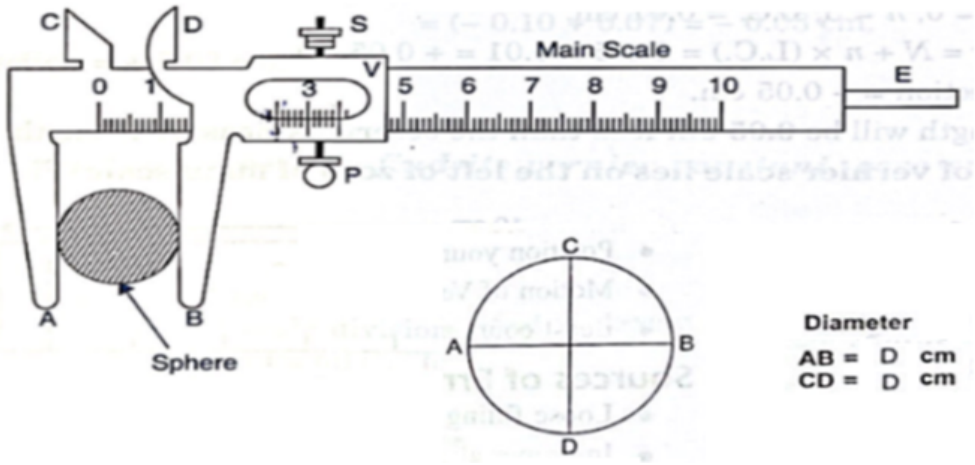
**PRECAUTION:**

1. The jaws should be pressed gently.
2. Position your eyes directly over the division mark to avoid parallax error.
3. Motion of vernier scale or main scale should be made smooth.
4. Least count and zero error should be determined carefully and properly.

**SOURCES OF ERROR:**

1. Loose fitting of vernier scale on main scale.
2. Improper alignment between the jaws and the main scale.
3. Incorrect and unclear graduation in scale.
4. Possible parallax error

## DIAGRAM


C
D
S
Main Scale
V
0
1
3
5
6
7
8
9
10
E
P
A
B
Sphere
C
A
B
D
Diameter
AB = D cm
CD = D cm

**OBSERVATION:**

To find the diameter of the given spherical body (D)

| NO | MSR(N) (cm) | VC(n) (Div) | VSR=(n*LC) (cm) | TR=(N+(n*LC)) (cm) | Mean |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |

Diameter of the sphere=.....cm

**CALCULATIONS:**

Diameter of the sphere,D=.....cm

Radius of the sphere,r=$\frac{D}{2}$=.....cm

Volume of the sphere, V=$\frac{4\Pi r^3}{3}$=