

Vernier    Callipers    ( BEAKER)    L.C = 0.01

Obs 1 :

Inner Diameter	Depth
i) M.S.R = 4.1	i) M.S.R = 5.4
ii) V.S.D = 2	ii) V.S.D = 8
iii) T.R = $M.S.R + \frac{L.S.D}{L.C}$ = $4.1 + 2 \times 10^{-2}$ = 4.12 C.m	iii) T.R = $5.4 + 8 \times 10^{-2}$ = 5.48

Obs 2 :

Inner Diameter	Depth
i) M.S.R = 3.5	i) M.S.R = 5.1
ii) V.S.D = 2	ii) V.S.D = 5
iii) T.R = $3.5 + 2 \times 10^{-2}$ = 3.52 C.m	iii) T.R = $5.1 + 5 \times 10^{-2}$ = 5.15

Obs 3 :

Inner Diameter	Depth
i) M.S.R = 3.3	i) M.S.R = 4.7
ii) V.S.D = 6	ii) V.S.D = 8
iii) T.R = $3.3 + 6 \times 10^{-2}$ = 3.36 C.m	iii) T.R = $4.7 + 8 \times 10^{-2}$ = 4.78 C.m

## Vernier Callipers (Sphere)

### Observation 1:

i) M.S.R = 0.9 cm

ii) L.C = 0.01 cm

iii) 5<sup>th</sup> Vernier scale division coincides with M.S.D

iv) Total Reading = M.S.R + L.C × V.S.R  
 $= 0.9 + (8 \times 0.01) \text{ cm}$   
 $= 0.98 \text{ cm} = TR_1$

### Observation 2:

i) M.S.R = 1 cm

ii) L.C = 0.01 cm

iii) 6<sup>th</sup> V.S.D coincides with M.S.D

iv) Total Reading = M.S.R + L.C × V.S.R  
 $= 1 + (6 \times 0.01) \text{ cm}$   
 $= 1.06 \text{ cm} = TR_2$

### Observation 3:

i) M.S.R = 0.1 cm

ii) L.C = 0.01 cm

iii) 6<sup>th</sup> V.S.D coincides with M.S.D

iv) Total Reading = M.S.R + L.C × V.S.R  
 $= 0.1 + (6 \times 0.01) \text{ cm}$   
 $= 1.06 \text{ cm} = TR_3$

Avg. Reading =  $\frac{T.R_1 + T.R_2 + T.R_3}{3}$

$= \frac{0.98 + 1.06 + 1.06}{3} \text{ cm}$   
 $= \frac{3.10}{3} \text{ cm} = 1.067 \text{ cm}$



Venier callipers (IRON BLOCK)

Obs - 1 : ( $L \cdot C = 0.01 \text{ cm}$ )

(a) Length

$$\text{i)} M.S.R = 2.2 \text{ cm}$$

$$\text{ii)} V.S.D = 7$$

$$\begin{aligned} \text{iii)} T.R &= M.S.R \\ &\quad + L.S.D \times L.C \\ &= 2.2 + 7 \times 0.01 \\ &= 2.27 \text{ cm} \end{aligned}$$

(b) Breadth

$$\text{i)} M.S.R = 1.5 \text{ cm}$$

$$\text{ii)} V.S.D = 7$$

$$\begin{aligned} \text{iii)} T.R &= M.S.R \\ &\quad + L.S.D \times L.C \\ &= 1.5 + 7 \times 0.01 \\ &= 1.57 \text{ cm} \end{aligned}$$

(c)

Thickness  
Height

$$\text{i)} M.S.R = 0.5 \text{ cm}$$

$$\text{ii)} V.S.D = 6$$

$$\begin{aligned} \text{iii)} T.R &= M.S.R \\ &\quad + L.S.D \times L.C \\ &= 0.5 + 6 \times 0.01 \\ &= 0.54 \text{ cm} \end{aligned}$$

Obs - 2 :

(a) Length

$$\text{i)} M.S.R = 2.9 \text{ cm}$$

$$\text{ii)} V.S.D = 6$$

$$\begin{aligned} \text{iii)} T.R &= M.S.R \\ &\quad + L.S.D \times L.C \\ &= 2.9 + 6 \times 0.01 \\ &= 2.96 \text{ cm} \end{aligned}$$

(b) Breadth

$$\text{i)} M.S.R = 2.1 \text{ cm}$$

$$\text{ii)} V.S.D = 4$$

$$\begin{aligned} \text{iii)} T.R &= M.S.R \\ &\quad + L.S.D \times L.C \\ &= 2.1 + 4 \times 0.01 \\ &= 2.14 \text{ cm} \end{aligned}$$

(c)

Thickness  
Height

$$\text{i)} M.S.R = 0.9 \text{ cm}$$

$$\text{ii)} V.S.D = 4$$

$$\begin{aligned} \text{iii)} T.R &= M.S.R \\ &\quad + L.S.D \times L.C \\ &= 0.9 + 4 \times 0.01 \\ &= 0.94 \text{ cm} \end{aligned}$$

Obs - 3 :

(a) Length

$$\text{i)} M.S.R = 3.6$$

$$\text{ii)} V.S.D = 3$$

$$\begin{aligned} \text{iii)} T.R &= 3.6 \times 0.01 \times 3 \\ &= 3.63 \text{ cm} \end{aligned}$$

(b) Breadth

$$\text{i)} M.S.R = 2.3$$

$$\text{ii)} V.S.D = 6$$

$$\begin{aligned} \text{iii)} T.R &= 2.3 + 6 \times 0.01 \\ &= 2.36 \text{ cm} \end{aligned}$$

(c) thickness

$$\text{i)} M.S.R = 1.1$$

$$\text{ii)} V.S.D = 1$$

$$\begin{aligned} \text{iii)} T.R &= 1.1 + 1 \times 0.01 \\ &= 1.11 \text{ cm} \end{aligned}$$



## Venier Callipers

## Screw gauge

The screw gauge here has a positive error of 2 divisions and  $L.C = 0.005 \text{ mm}$ .

### (a) Lead shot

$$P.S.R = 7 \text{ mm}$$

$$H.S.R = 73$$

$$\text{Corrected H.S.R} = 73 - 3 \\ = 70$$

$$\begin{aligned} \text{Total Reading} &= P.S.R + (\text{Corrected H.S.R}) L.C \\ &= 0.7 \text{ mm} + (70) (5) \times 10^{-3} \text{ mm} \\ &= 5 \text{ mm} + 0.35 \text{ mm} \\ &= 5.35 \text{ mm} \end{aligned}$$

### (b) Wire

$$P.S.R = 0 \text{ mm}$$

$$H.S.R = 79$$

$$\text{Corrected H.S.R} = 79 - 3 \\ = 76$$

$$\begin{aligned} \text{Total Reading} &= P.S.R + (\text{Corrected H.S.R}) L.C \\ &= 0 + (76) (5) \times 10^{-3} \text{ mm} \\ &= 0.380 \text{ mm} \end{aligned}$$

### (c) glass plate

$$P.S.R = 1.5 \text{ mm}$$

$$H.S.R = 72$$

$$\text{Corrected H.S.R} = 72 - 3 = 69$$

$$\begin{aligned} \text{Total Reading} &= 1.5 + 69 \times 10^{-3} \\ &= 1.845 \text{ mm} \end{aligned}$$

Variety

Obs 1°

Diameter

$$i) M.S.R = 2.1$$

$$ii) V.S.D = 0$$

$$iii) T.R = M.S.R + V.S.D \times 10^{-2}$$

$$= 2.1 + 0.00$$

$$= 2.10 \text{ cm}$$

Length

$$i) M.S.R = 3.4$$

$$ii) V.S.D = 6$$

$$iii) T.R = 3.4 + 6 \times 10^{-2}$$

$$= 3.46 \text{ cm}$$

Obs 2°

Diameter

$$i) M.S.R = 2.6 \text{ cm}$$

$$ii) V.S.D = 3$$

$$iii) T.R = 2.6 + 3 \times 10^{-2}$$

$$= 2.63 \text{ cm}$$

Length

$$i) M.S.R = 3.7$$

$$ii) V.S.D = 6$$

$$iii) T.R = 3.7 + 6 \times 10^{-2}$$

$$= 3.76 \text{ cm}$$

Obs 3°

Diameter

$$i) M.S.R = 2.2$$

$$ii) V.S.D = 7$$

$$iii) T.R = 2.2 + 7 \times 10^{-2}$$

$$= 2.27 \text{ cm}$$

Length

$$i) M.S.R = 3.5$$

$$ii) V.S.D = 9$$

$$iii) T.R = 3.5 + 9 \times 10^{-2}$$

$$= 3.59 \text{ cm}$$

### i) Irregular R Lamina

Area  
Length of Rectangle = 3 cm = 30 mm  
Breadth of Rectangle = 2.2 cm = 22 mm  
Height of Triangle = 16 mm  
Side & length = 13 mm

$$\text{Area of Rectangle} = 660 \text{ mm}^2$$
$$\text{Area of Triangle} = 104 \text{ mm}^2$$
$$\text{Total Area} = 764 \text{ mm}^2$$

### Thickness

$$i) P.S.R = 2 \text{ mm}$$

$$ii) H.S.R = 56$$

$$iii) \text{Corrected H.S.R} = 58$$

$$\text{Total reading} = 0.2 + 58 \times 10^{-3}$$
$$= 2.58 \text{ mm}$$

## Spherometer

a) plane glass slab

$$\text{Given, } L = 40 \text{ mm}$$

$$L.C = 0.01 \text{ mm}$$

$$L.C = \frac{\text{Pitch}}{\text{No. div of circular board}}$$

$$\Rightarrow \text{Pitch} = L.C \times \text{No. div}$$

$$= 0.01 \times 100$$

$$= 1 \text{ mm}$$

$$a = 98 \text{ mm}$$

$$b = 1 \text{ mm}$$

$$n = a - b = 97 \text{ mm}$$

$$\text{no. of rotations} = n = 3$$

$$\text{Thickness (t)} = (h \times p) + (n \times L.C)$$

$$= 3 \times 1 \text{ mm} + 97 \times 0.01 \text{ mm}$$

$$= 3.97 \text{ mm}$$

b) Spherical surface

$$a = 39 \text{ mm}, b = 7 \text{ mm}, \text{ no. of full rotations} = n = 3$$

$$n = (100 + a) - b$$

$$= (100 + 39) - 79 \text{ mm}$$

$$= 60 \text{ mm}$$

$$\text{Height (h)} = (n \times p) + (n \times L.C)$$

$$= 3 \times 1 + 60 \times 0.01 = 3.6 \text{ mm}$$

$$\text{Radius} = \frac{l^2}{32} + \frac{h}{2} \Rightarrow R = \frac{1600}{32} \text{ mm} + 1.8 =$$

## ① Irregular Lamina

### Area

$$\text{length of rectangle} = 3 \times 0.5 \text{ cm} = 1.5 \text{ cm}$$

$$\text{Breadth of Rectangle} = 2.2 \times 0.5 \text{ cm} = 1.1 \text{ cm}$$

$$\text{Height of Triangle} = 1.6 \times 0.5 \text{ cm} = 0.8 \text{ cm}$$

$$\text{side of Triangle} = 1.3 \times 0.5 \text{ cm} = 0.65 \text{ cm}$$

$$\text{Area of } \Delta = \frac{1}{2} \times 0.8 \times 0.65 \text{ mm}^2$$

$$\text{Area of Rectangle} = 1.1 \times 0.65 \text{ mm}^2$$

### Thickness

~~tooth~~

$$P.S.R = 1.5$$

$$H.S.R = 83$$

$$\text{corrected H.S.R} = 83 - 3$$

$$\text{Total readings} = 1.5 + \frac{80 \times 10^{-3} \times 5}{0.4}$$

$$= 1.9 \text{ mm}$$

## Screw gauge

(Lead shot)

The screw gauge here has a negative error of 2 divisions & Least Count = 0.01 mm

### (a) Lead shot

$$P.S.R = 0.5 \text{ cm}$$

$$H.S.R = 76$$

$$\text{Corrected } H.S.R = 76 + 2 \\ = 78$$

$$\begin{aligned} \text{Total Reading} &= (0.5) + (78) \times 10^{-3} \\ &= 0.578 \text{ cm} \\ &= 5.78 \text{ mm} \end{aligned}$$

### (b) Wire

$$P.S.R = 0 \text{ cm}$$

$$H.S.R = 63$$

$$\text{Corrected } H.S.R = 63 + 2 \\ = 65$$

$$\begin{aligned} \text{Total Reading} &= 0 + (65) \times 10^{-3} \\ &= 0 + (65) \times 10^{-3} \text{ cm} \\ &= 0.065 \text{ cm} \\ &= 0.65 \text{ mm} \end{aligned}$$

### (c) glass plate

$$P.S.R = 0.2 \text{ cm}$$

$$H.S.R = 64$$

$$\text{Corrected } H.S.R = 66$$

$$\begin{aligned} \text{Total Reading} &= (0.2 + 66 \times 10^{-3}) \text{ cm} \\ &= 2.66 \text{ mm} \end{aligned}$$

d) Ineq  
area  
length of  
Bread  
Height  
side  
  
area of  
area of  
Total  
Thickness  
i)  
ii)  
iii)  
  
Total

## Vernier Calipers

Select an object:

- Sphere
- Iron block
- Beaker
- Cylinder

Select what to measure:

- Diameter

**Result**

Enter reading (cm):  ✓

**L.C = 0.01cm**

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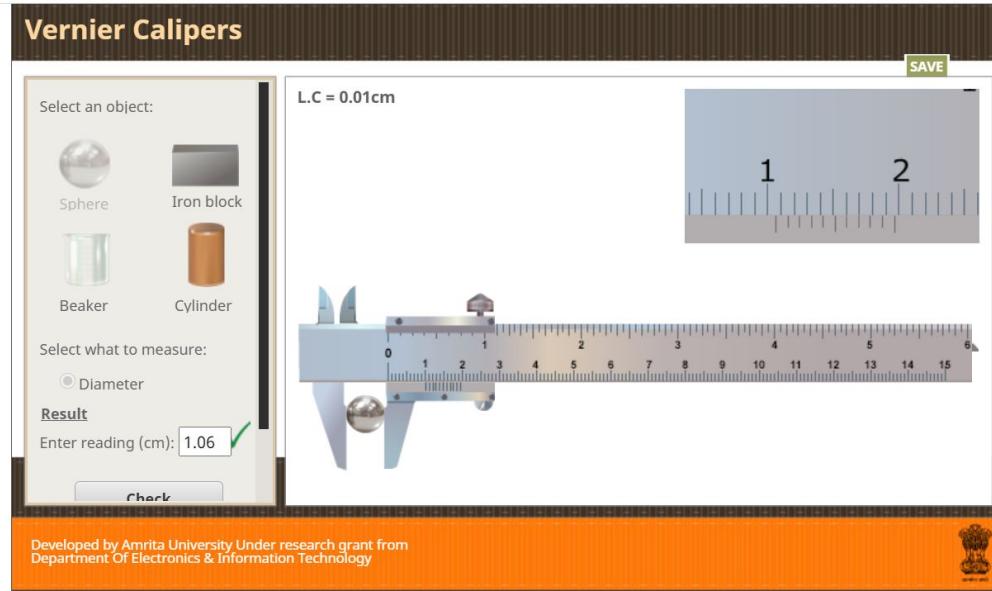
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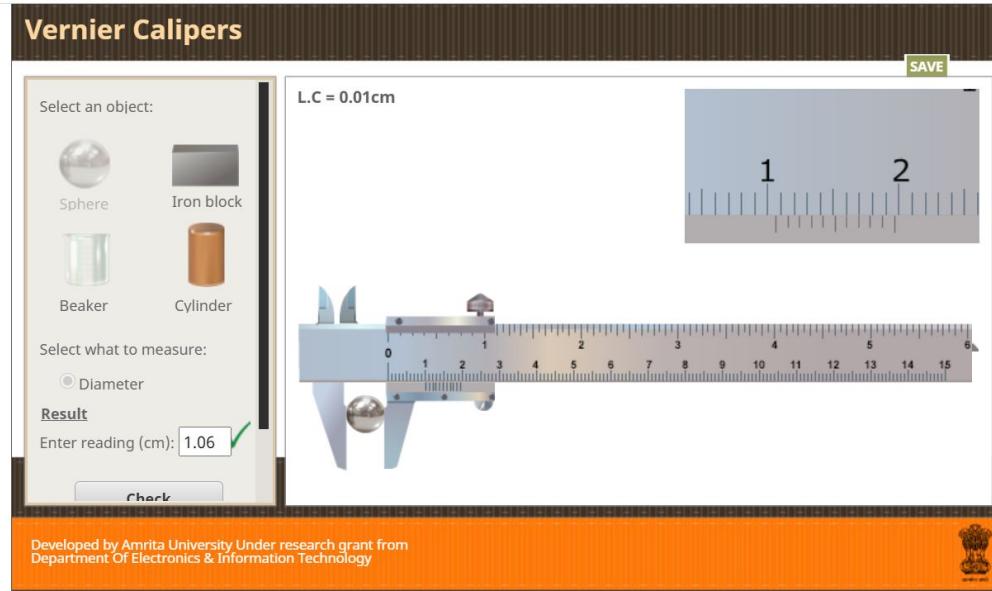
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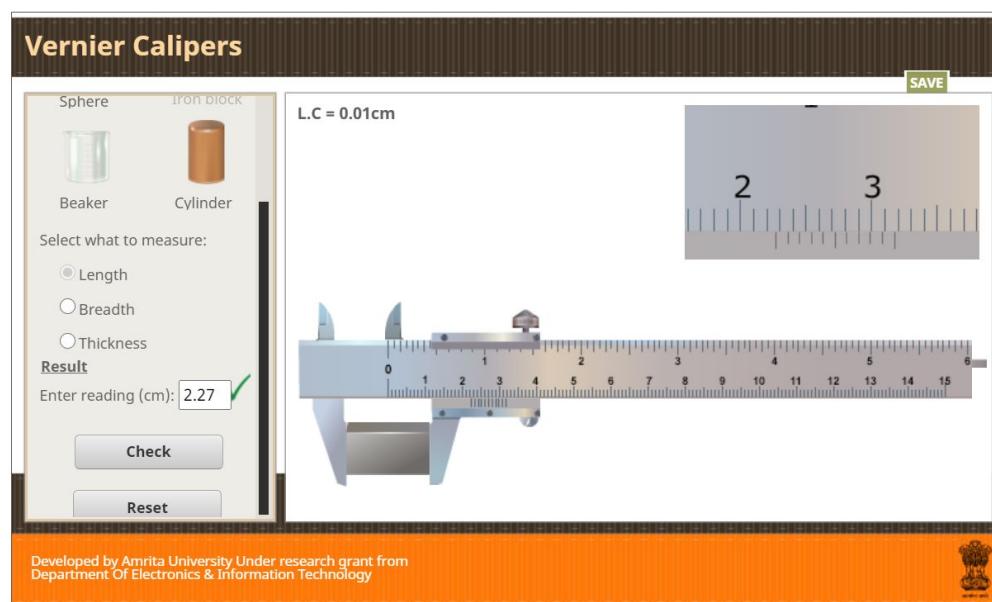
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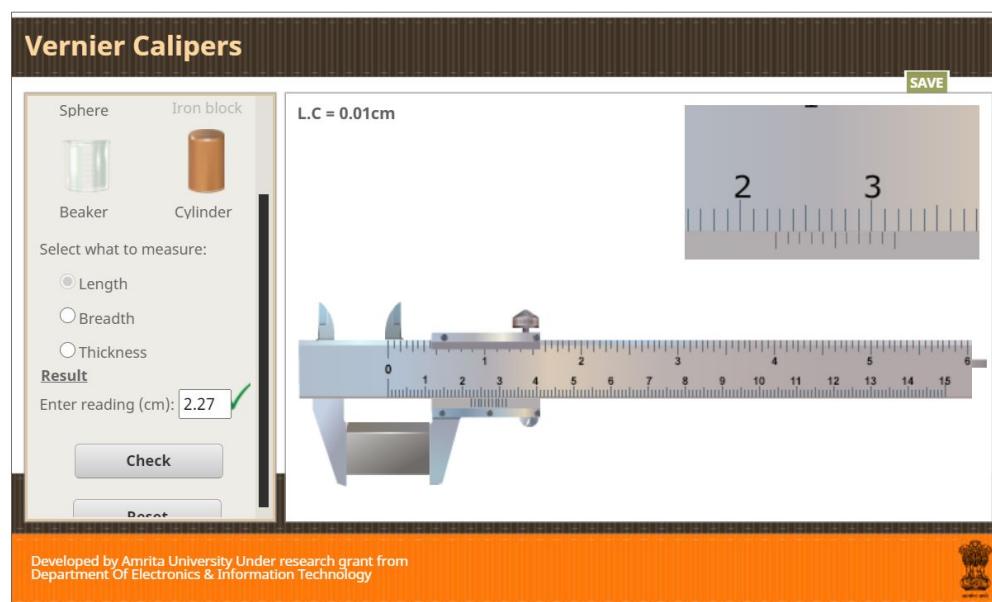




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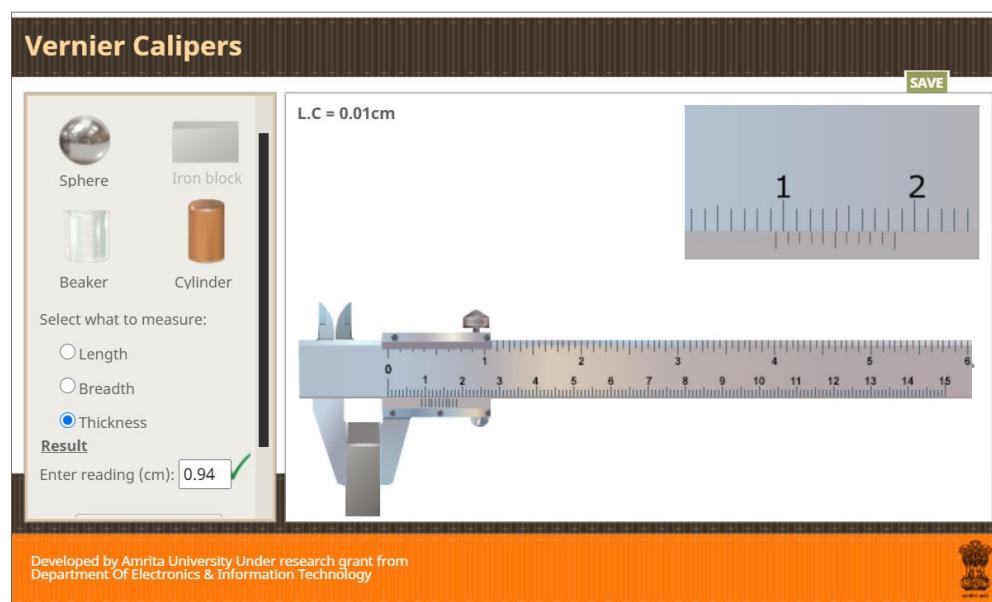
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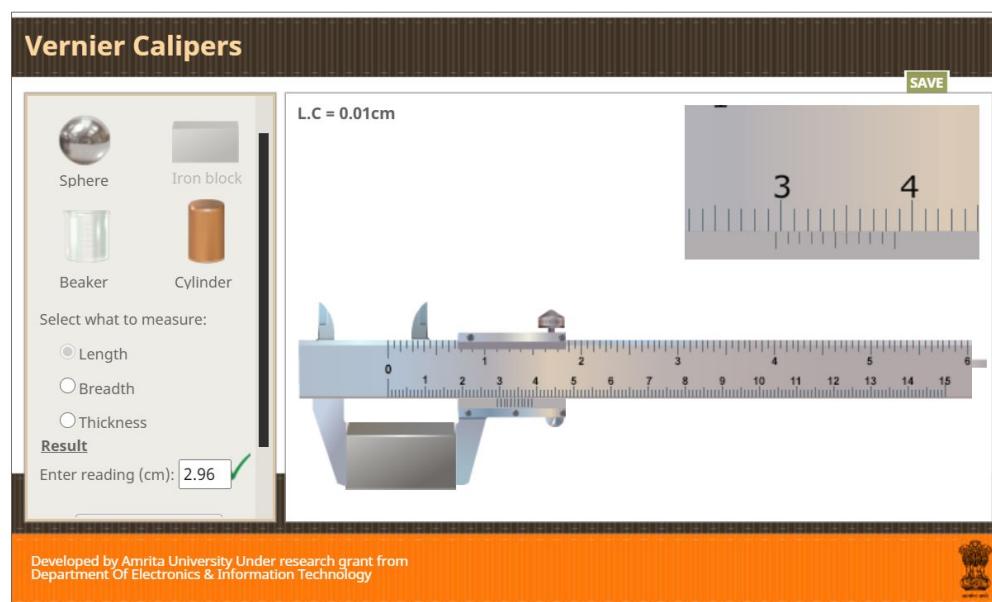
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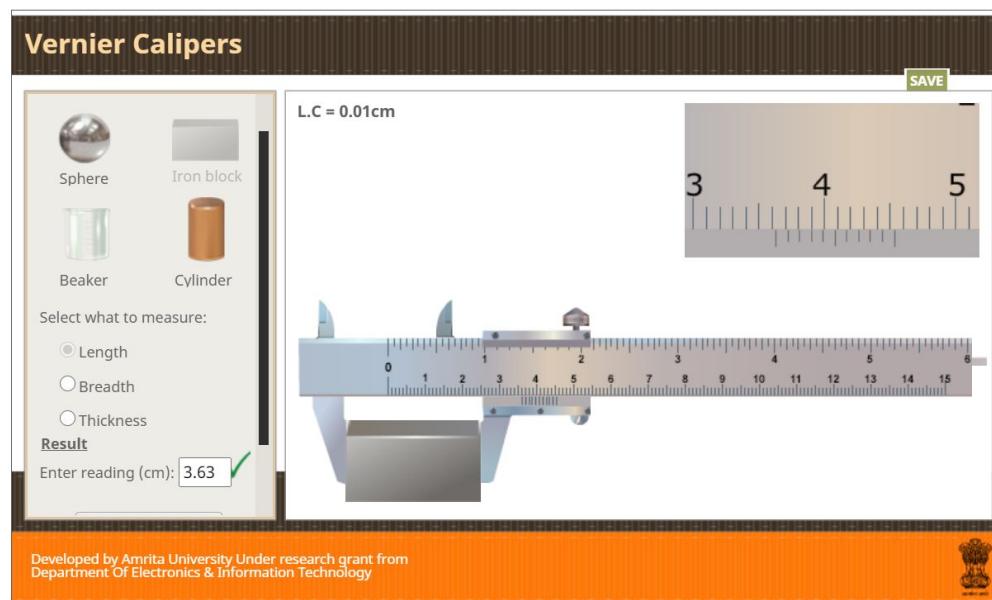
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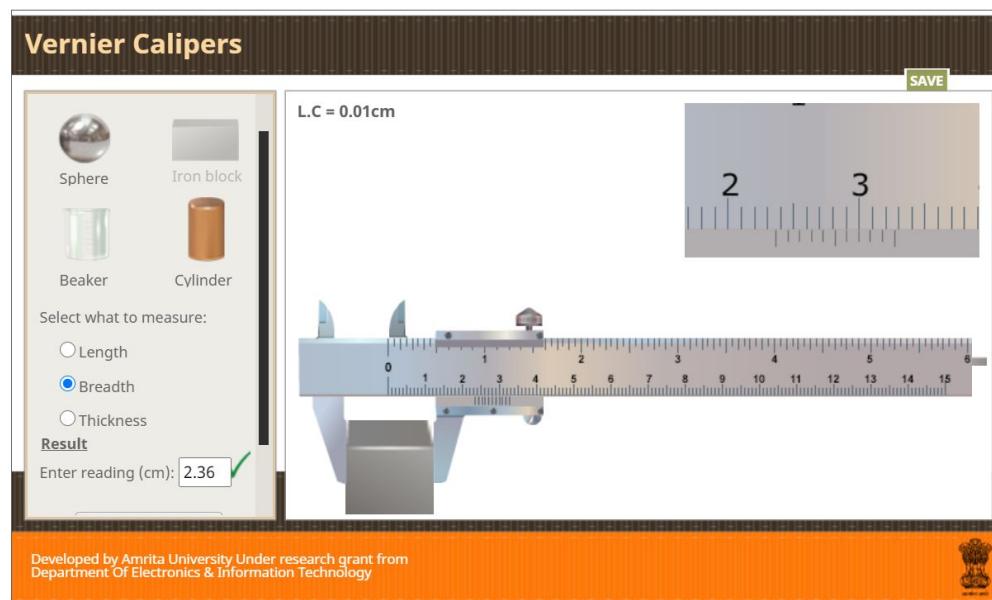
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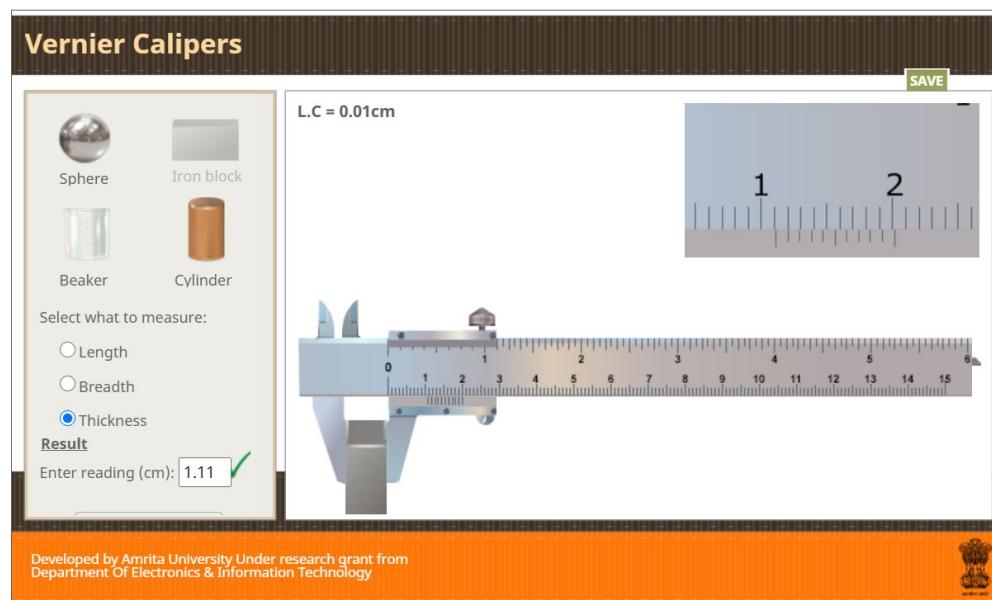
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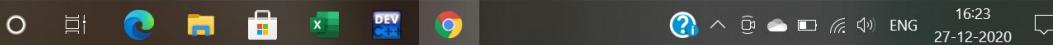


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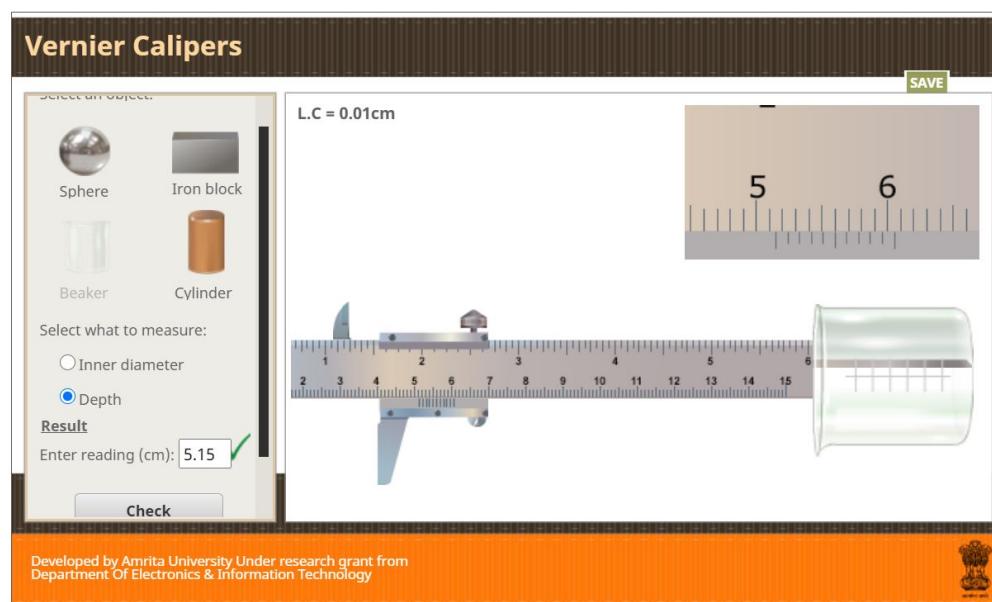
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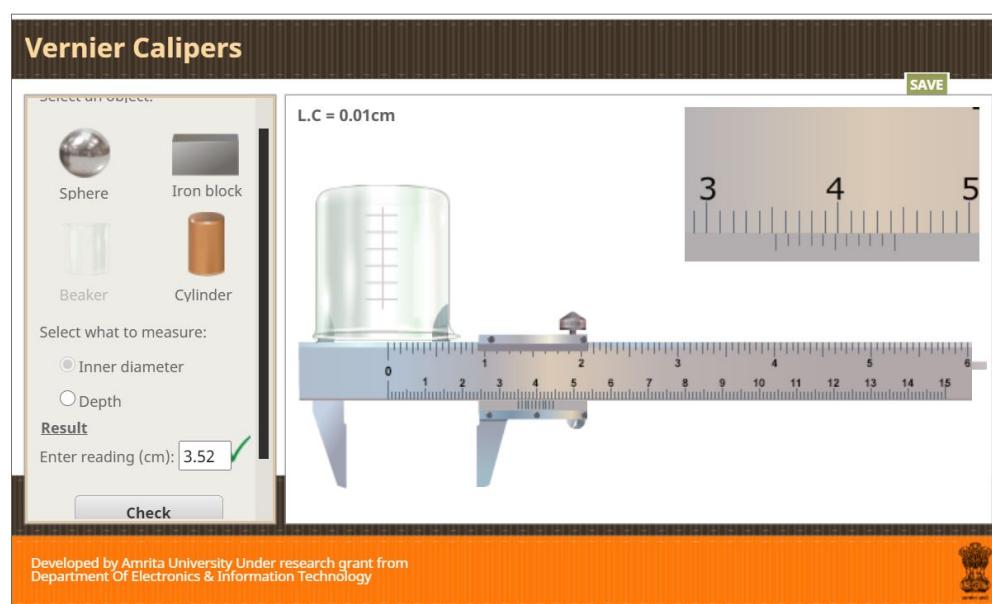
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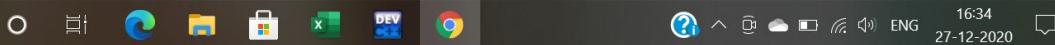


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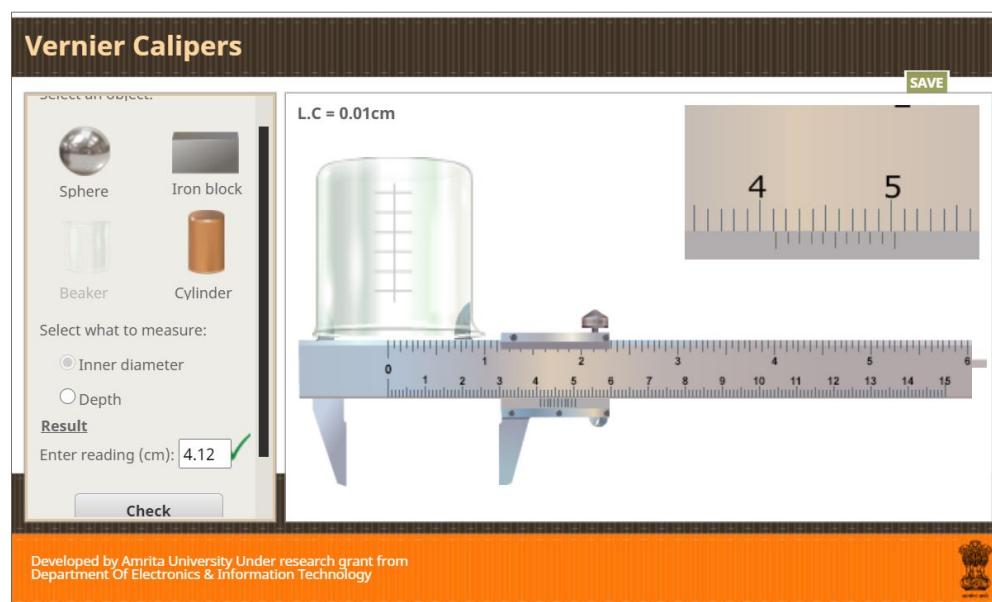
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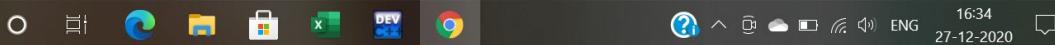


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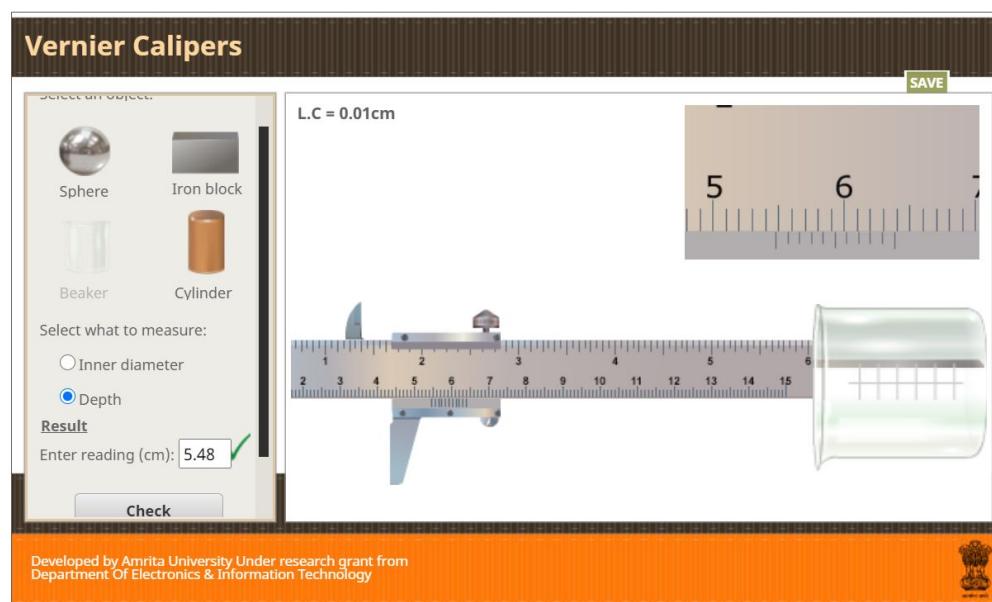
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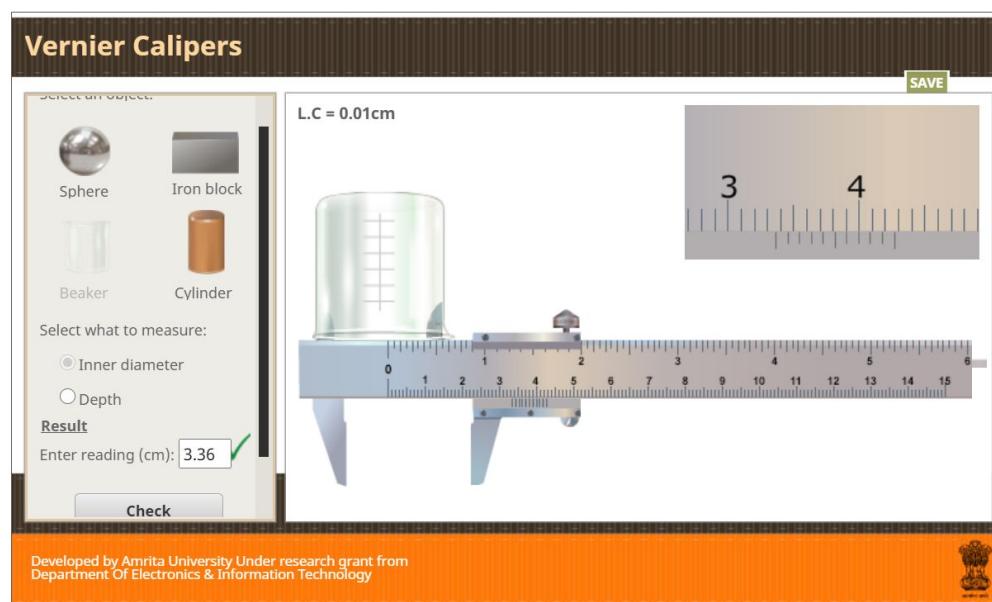
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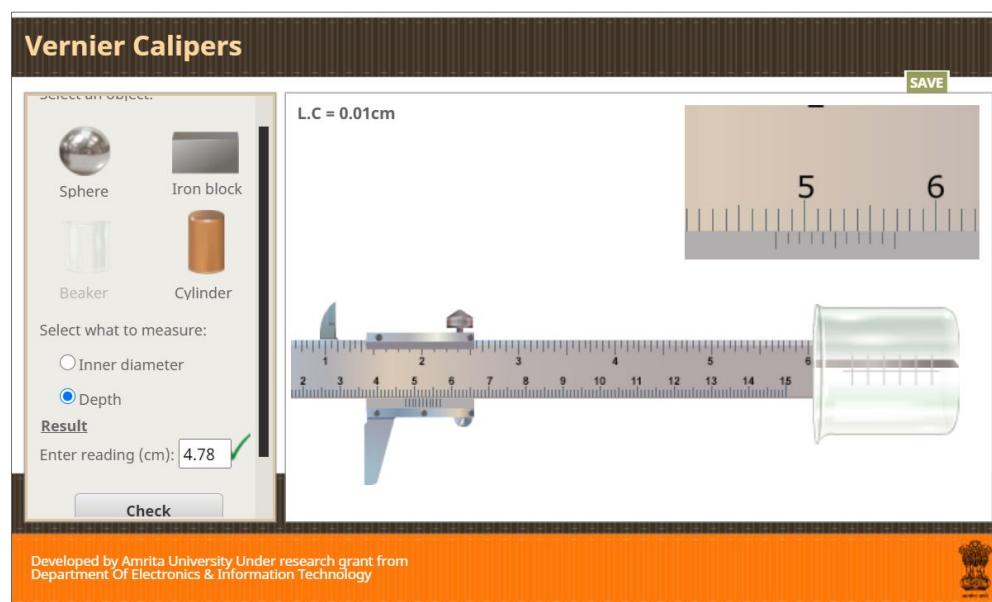
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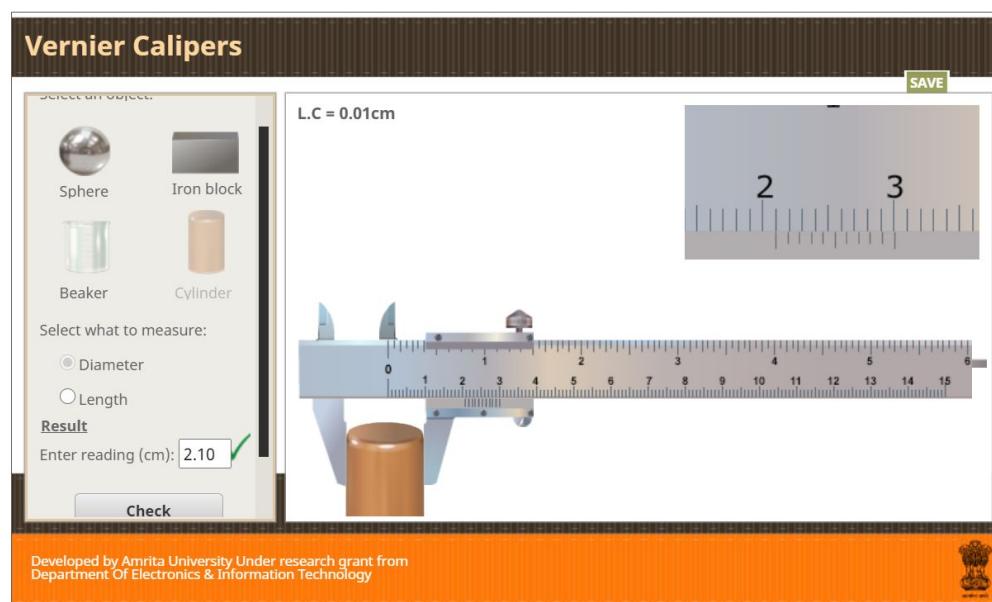




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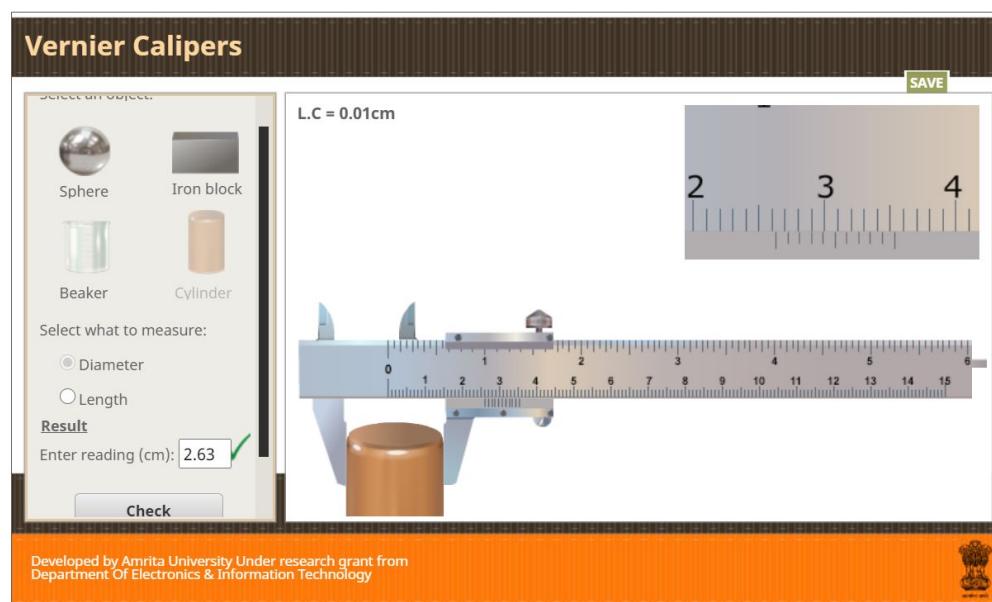


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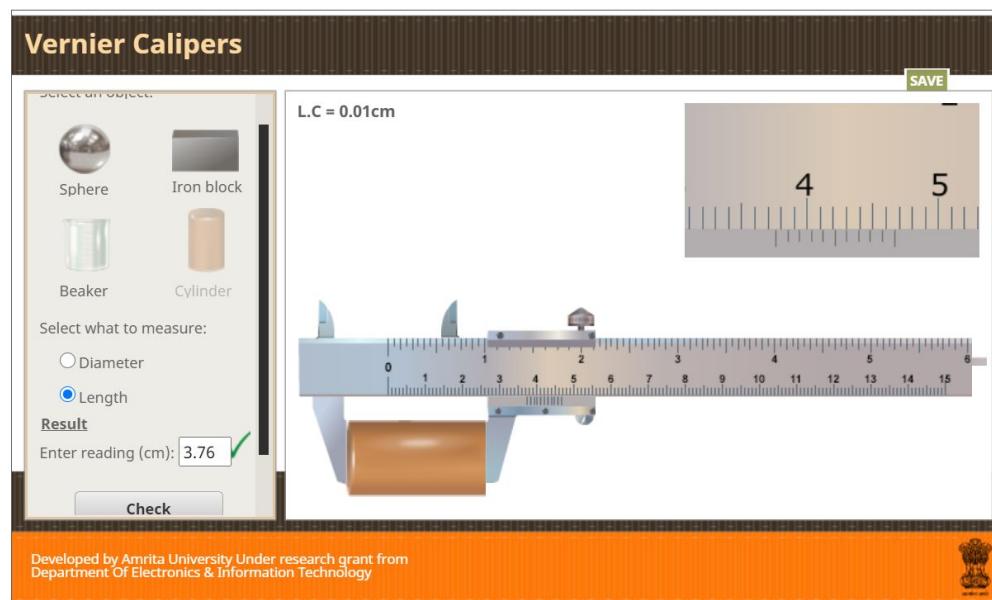
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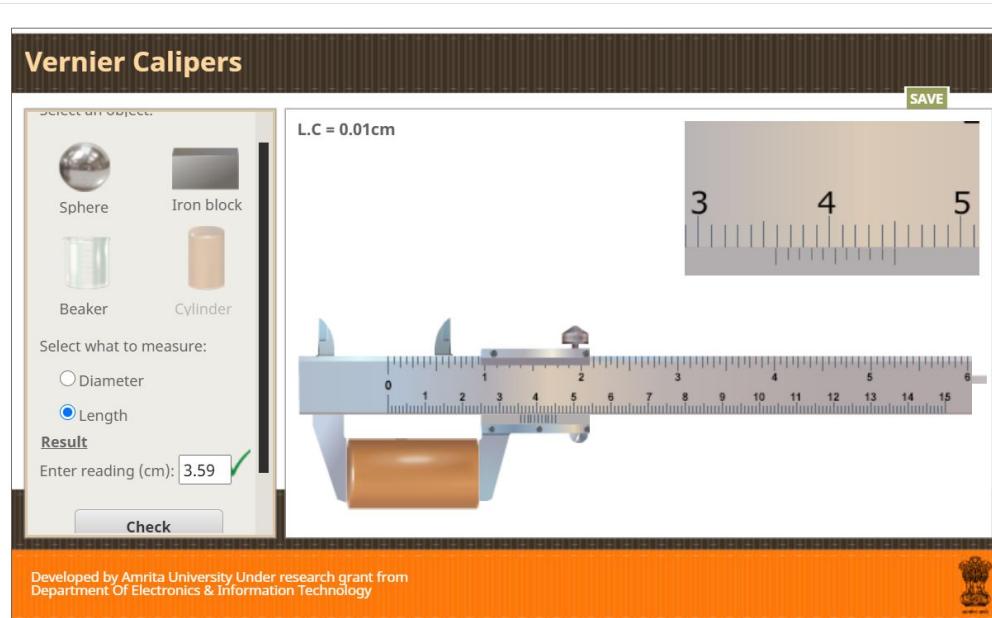
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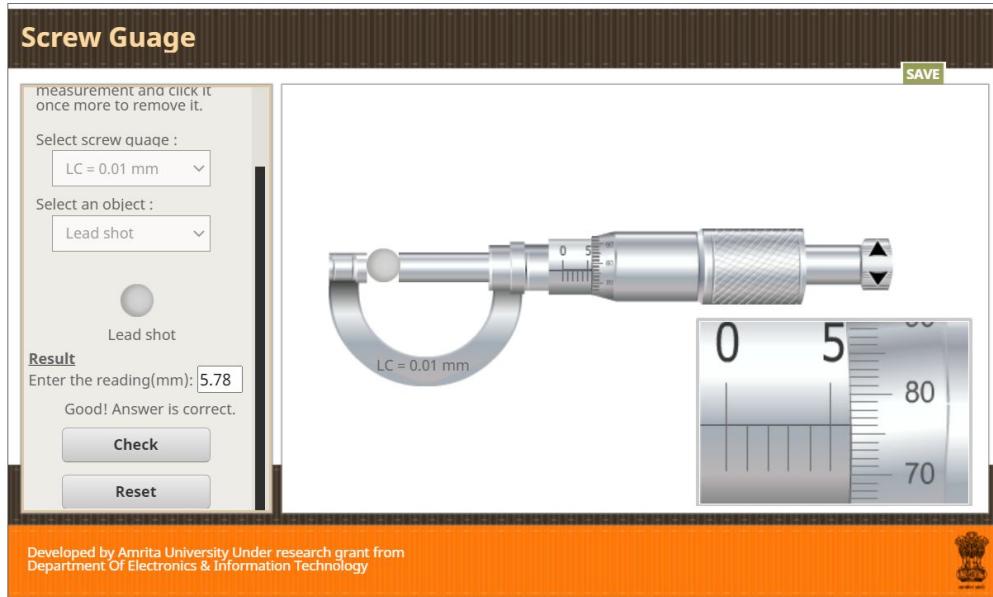


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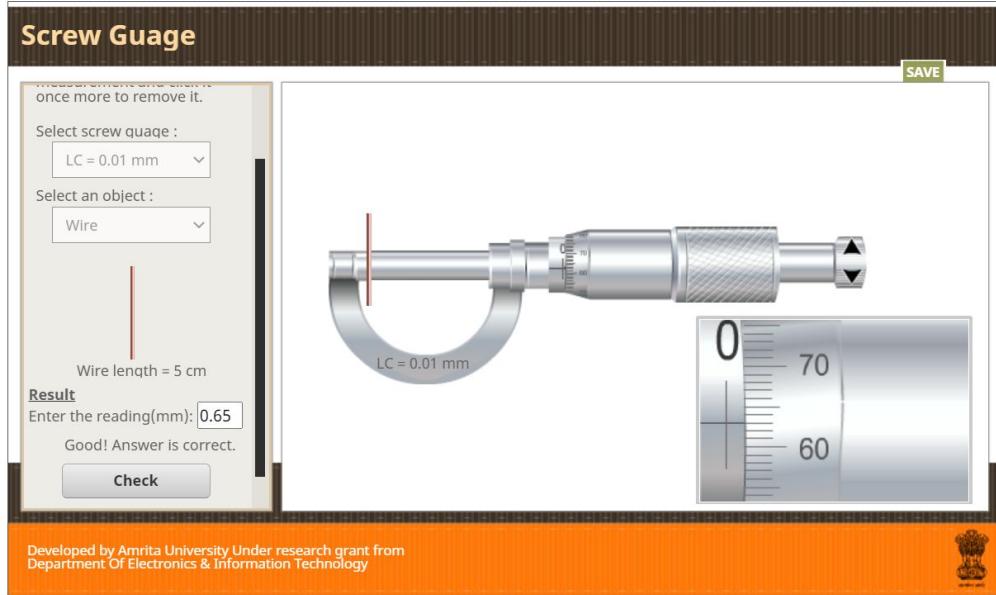
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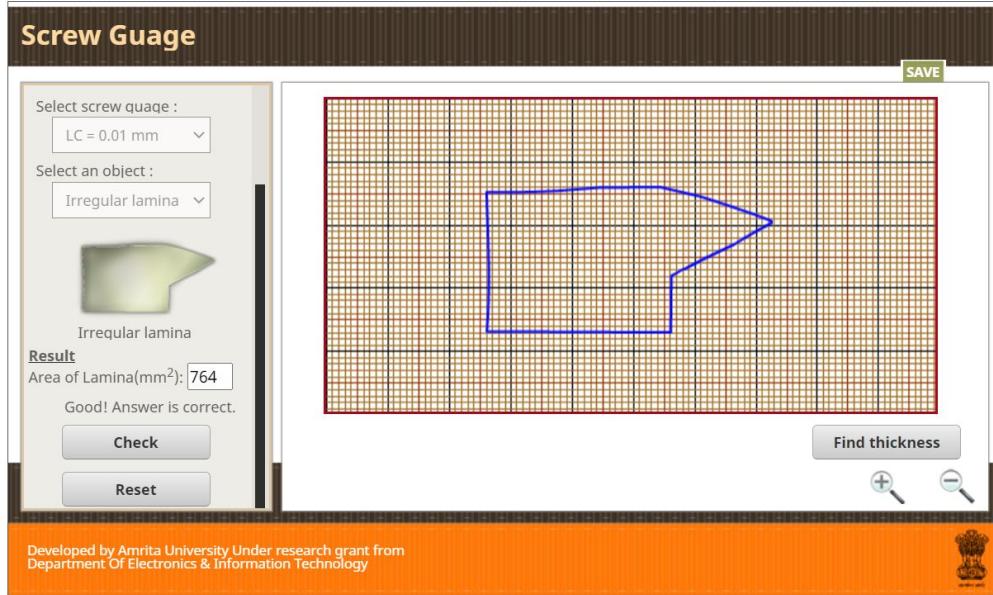
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## Screw Guage

Check for zero error.

Click on the object to find its measurement and click it once more to remove it.

Select screw quage :

LC = 0.005 mm

Select an object :

Lead shot

Result

Enter the reading(mm): 5.35

Good! Answer is correct.

SAVE

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**Screw Guage**

measurement and click it once more to remove it.

Select screw guage : LC = 0.005 mm

Select an object : Wire

Wire length = 5 cm

**Result**

Enter the reading(mm): 0.380

Good! Answer is correct.

Check

SAVE

LC = 0.005 mm

0 90  
80  
70

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## Screw Guage

LC = 0.005 mm

Select an object:

Glass plate

Glass plate

Result

Enter the reading(mm): 1.845

Good! Answer is correct.

Check

Reset

SAVE

LC = 0.005 mm

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## Screw Guage

LC = 0.005 mm

Select an object:

Glass plate

Glass plate

Result

Enter the reading(mm): 1.845

Good! Answer is correct.

Check

Reset

SAVE

LC = 0.005 mm

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**Screw Guage**

Select screw queae : LC = 0.005 mm

Select an object : Irregular lamina

Irregular lamina

**Result**  
Area of Lamina(mm<sup>2</sup>): 764  
Good! Answer is correct.

Check Reset

Find thickness

SAVE

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## Screw Guage

Select screw quage : LC = 0.005 mm

Select an object : Irregular lamina

Irregular lamina

**Result**

Enter the reading(mm): 1.9

Good! Answer is correct.

Check Reset

SAVE

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## Screw Guage

Select screw quage : LC = 0.005 mm

Select an object : Irregular lamina

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**Result**  
Enter the reading(mm): 1.9  
Good! Answer is correct.

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SAVE

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## Screw Guage

Select screw quage : LC = 0.005 mm

Select an object : Irregular lamina

Irregular lamina

**Result**

Enter the reading(mm):

Check Reset

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19:35 27-12-2020 ENG

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## Screw Guage

Select screw quage : LC = 0.01 mm

Select an object : Irregular lamina

Irregular lamina

Result

Enter the reading(mm):

Check

Reset

SAVE

LC = 0.01 mm

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**SAVE**

## Spherometer

Select/Remove the object:



Spherical surface



Glass strip

### **Result**

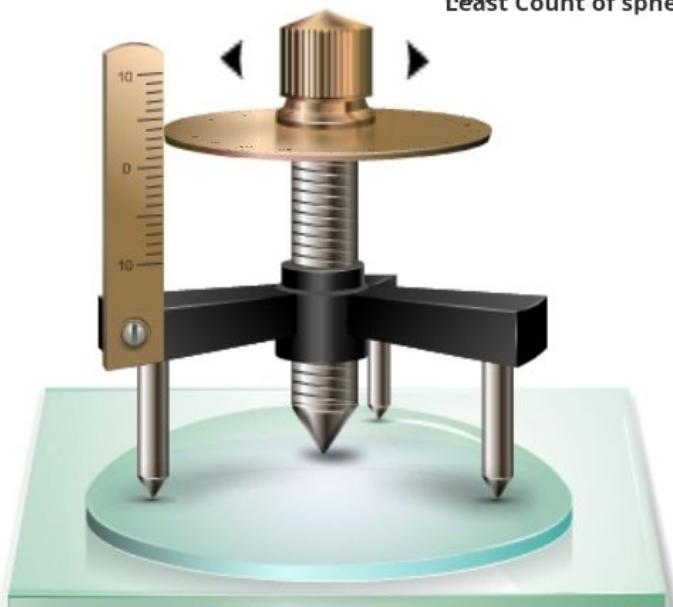
Enter the answer in mm:

**Check**

**Reset**

Show Result

Distance between two legs of spherometer = 40  
Least Count of spherometer = 0.01 mm.



SAVE

## Spherometer

Select/Remove the object:



Spherical surface



Glass strip

### Result

Enter the answer in mm:

3.97

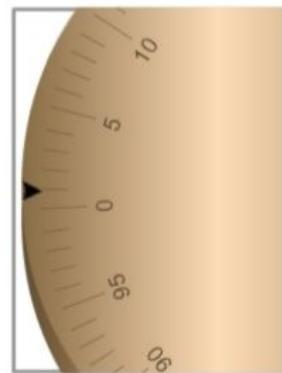


Check

Reset

Show Result

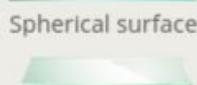
Distance between two legs of spherometer = 40 mm  
Least Count of spherometer = 0.01 mm.



SAVE

## Spherometer

Select/Remove the object:



### Result

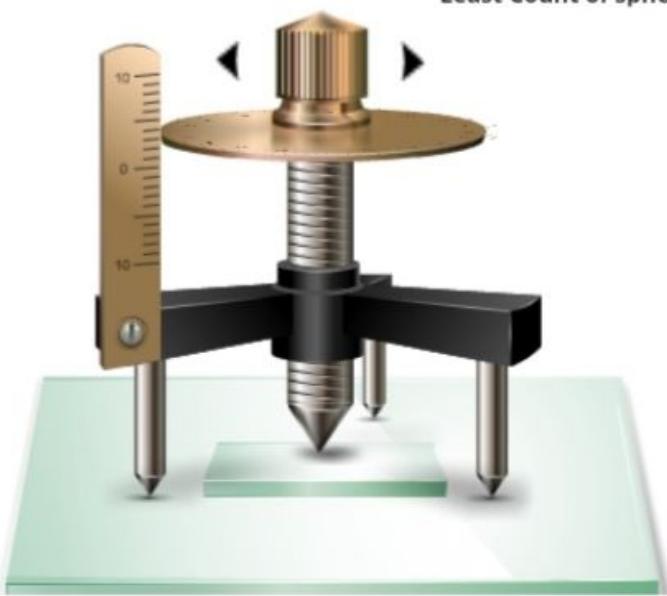
Enter the answer in mm:

Check

Reset

Show Result

Distance between two legs of spherometer = 40 mm  
Least Count of spherometer = 0.01 mm.



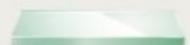
# Spherometer

SAVE

Select/Remove the object:



Spherical surface



Glass strip

## Result

Enter the answer in mm:

75.87



Check

Reset

Show Result

Distance between two legs of spherometer = 40 mm  
Least Count of spherometer = 0.01 mm.

