

EXPERIMENT 1: MEASUREMENT AND UNCERTAINTY**Course Learning Outcome:**

Solve problems related to Physics of motion, force and energy, waves, matter and thermodynamics
(C4, PLO 4, CTPS 3, MQF LOD 6)

Learning Outcomes:

At the end of this lesson, students will be able to describe technique of measurement and determine uncertainty of length of various objects.

Student Learning Time:

Face-to-face	Non face-to-face
1 hour	1 hour

Direction: Read over the lab manual and then answer the following question.

Introduction

1. Complete **Table 1**

Basic Quantity	Symbol	SI Unit (with symbol)	Measuring Instrument
Length	l		
Mass	m		
Time	t		
Electric Current	I		
Temperature	T		

Table 1

2. is used to measure the diameter of a coin.
3. Micrometer screw gauge is usually used to measure the of a thin wire or the
..... of paper.

4. Complete **Table 2**



Measuring Instrument	Uncertainty
Ruler 	±
Vernier calipers 	±
Micrometer screw gauge 	±

Table 2

5. State **TWO** types of reading:

i.

ii.

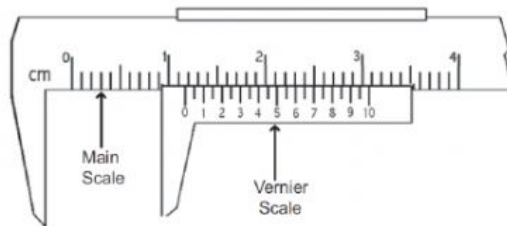
Experiment

6. Complete **Table 3**

Measurement	Measuring Instrument	Uncertainty/ Smallest scale	Type of reading (single point/two point/vernier scale)
Length of a book		\pm	
Diameter of a spherical object		\pm	
Width of a square object		\pm	

Table 3

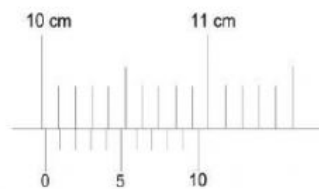
7. Determine the reading for the following measurements:



Main scale :

Vernier scale :

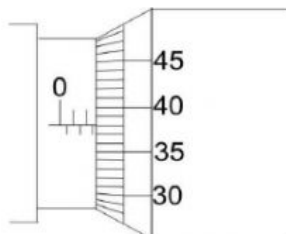
Actual reading :



Main scale :

Vernier scale :

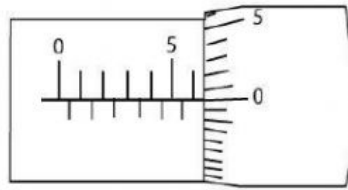
Actual reading :



Main scale :

Vernier scale :

Actual reading :



Main scale :

Vernier scale :

Actual reading :

Data Analysis8. Complete **Table 4**

No	Diameter of ball bearing, $d (\pm 0.01 \text{ mm})$	$ \bar{d} - d_i (\text{mm})$
1	2.50	
2	2.52	
3	2.52	
4	2.50	
	Average, $\bar{d} =$	$\Delta \bar{d} =$

Table 49. Express your answer as $(\bar{d} \pm \Delta \bar{d})$ $(\quad \pm \quad) \text{ mm}$

10. Calculate the percentage of uncertainty.

$$\frac{\Delta \bar{d}}{\bar{d}} \times \quad =$$

11. For the precautionary steps below, fill in the blank with the most appropriate word:

zero accuracy parallel instrument perpendicular

- Check the _____ error before taking data.
- Use appropriate _____ for each measurement.
- Check the _____ of the instrument before taking data.
- Keep the ruler _____ to the edge of the book when taking the reading.
- Make sure the observer's eye _____ to the scale before taking the reading (data).