Name: _____ **Date:** _____

Partner(s): _____ **Period:** _____

Measurements Lab

(2022)

Object:

The two objects of this experiment are to use various instruments to the precision they allow and to use the mathematics of significant digits.

Theory:

Each instrument has an inherent amount of uncertainty in its measurement. Even the most precise measuring device cannot give the actual value because to do so would require an infinitely precise instrument. A measure of the precision of an instrument is given by its uncertainty. As a good rule of thumb, the uncertainty of an analog measuring device is 10% of the least count. The uncertainty of a digital device is 50% of the least count. The least count is the smallest subdivision given on the measuring device. The uncertainty of the measurement should be given with the actual measurement, for example, 44.23± 0.01 cm.

Parallax is the apparent motion of near objects with respect to distant objects. It is one of the means that we have of perceiving depth. However, in measuring, parallax can give rise to a very serious error in reading an instrument. The aim is always to reduce parallax to the minimum degree. Always read an instrument straight on. Do not look at an angle.

Precision (reliability) is a measure of the degree of agreement of one numerical result with other values obtained under similar conditions. Accuracy is a measure of the degree of agreement of one numerical result with the true value.

An analog instrument is one where the scale changes gradually from one value to the next. Typically there is a dial face and a needle pointer that moves from one mark to the next in an even fashion.

A digital instrument is one were the measurement is displayed as a series of numbers. The numbers are displayed and will only change when a certain internal switching point is crossed. A digital instrument does not, per se, have a higher degree of precision than an analog instrument. However, since all the research in instrumentation is being done in the realm of digital instruments most digital instruments will surpass the precision of analog instruments in the future.

Procedure:

Part I

Using various instruments read and record the measurements to the precision allowed.

Part II

Use the unmarked, decimeter and regular meter sticks to measure the length, width and height of the piece of wood that is given to you. Use the instrument to the best precision possible**. RECORD ALL LENGTHS IN METERS.**

Data:

Record all the data with the appropriate units, ***NEATLY***, in the following table.

Part I (include the units)

Instrument	**Measurement**
Triple beam balance	
Electronic balance	
Ammeter	
Voltmeter	
Thermometer	
Pendulum (use digital stopwatch)	
Graduated cylinder	

Part II (BEWARE OF PARALLAX)

	Unmarked (m)	**Decimeter (m)**	**Regular (m)**
Length			
Width			
Thickness			

Calculations: (Show your work below. Remember to use significant digit arithmetic rules.)

Meter stick	Area (largest side) (m^2)	Volume (m^3)
Unmarked		
Decimeter		
Regular		

Conceptual Questions:

1. Describe the correct technique in measuring an unknown quantity using an instrument to the precision it allows.

2. What is the name of the measurement system used by the United States? How does it differ from the metric system?

3. Do you believe that the US should change to the metric system? Justify your answer?