ACCURACY OF MEASUREMENTS AND COMPUTATIONS

Object:

To illustrate the precision of laboratory results by finding the density of certain solids, and the uncertainty in the density.

Apparatus:

Vernier caliper, 30cm scale, micrometer caliper, weighing scales, wooden block, piece of large metal wire.

Part of this experiment consists of calculating the density of a wooden block. Mass density is defined as the mass of an object divided by its volume, **D** = **M** / **V.** The concept of density is very useful when comparing the relative mass of different materials and when calculating the mass of an object whose volume and density are known.

Procedure:

Part (1): Measure the length, width and height of the wooden block; use the meter stick and/or Vernier caliper. Take four readings of each dimension, and give the numerical and fractional uncertainty for each dimension. Determine the mass of the block using the scales and give the numerical and fractional uncertainty. The following table may be used as a guide for recording the data. Give units with the dimensions and mass. Compute the volume and density along with the fractional and numerical uncertainties.

Table of Data (Example)

Wooden Block				**Mean Dimension**	**Numerical Uncertainty**	**Fractional Uncertainty**
Length	**Width**	**Depth**	**Mass**	**Length=**		
				Width=		
				Depth=		
				Mass=		

Computed Volume _____. _____
(with numerical uncertainty) (units) (fractional uncertainty)

Computed Density _____. _____
(with numerical uncertainty) (units) (fractional uncertainty)

Part (2). Measure the diameter of the metal wire with the micrometer caliper. Take about six (6) measurements at distributed points along the length of the wire; turn the wire slightly between measurements.

Table of Data (Example)

Metal rod			**Mean Dimension**	**Numerical Uncertainty**	**Fractional Uncertainty**
Radius	**Length**	**Mass**	**Radius=**		
			length=		
			Mass=		

Computed Volume _____. _____
(with numerical uncertainty) (units) (fractional uncertainty)

Computed Density _____. _____
(with numerical uncertainty) (units) (fractional uncertainty)

Caution: Turn the micrometer screw by means of the small end-knob. Why? Correct for possible zero error when the jaws are closed. Measure the length of the wire. (Allow for sloping ends, as you wish to find the volume.) Record the mean diameter and length, and give the numerical and fractional uncertainties. Record the mass of the wire, and its uncertainty.

Compute the volume and density of the metal wire along with the numerical and fractional uncertainties. You will be given a list of densities for different metals. Determine the composition of the wire from the value you obtained for its density.