WEBQUEST: The Meaning of Measure,
Dealing with Error and Uncertainty in Measured Values

Go to the following website and read the article. (Also available in PDF)

http://www.chem1.com/acad/webtext/matmeasure/mm2.html

Explain, giving examples, the following quotations from the article.

1. "The exact distance between the upper lip and the tip of the dorsal fin will forever be hidden in a fog of uncertainty."

2. "Uncertainty is certain!"

3. "In science, there are numbers and there are "numbers."
4. “All measurements of quantities that can assume a continuous range of values (lengths, masses, volumes, etc.) consist of two parts: the reported value itself (never an exactly known number), and the uncertainty associated with the measurement.”

5. “All measurements are subject to error which contributes to the uncertainty of the result.”

6. “Whether we are conscious of it or not, all measured values contain an element of random error.”

7. “Unlike random error, which is impossible to eliminate, systematic errors are usually quite easy to avoid or compensate for.”

8. “If you run a number of replicate (that is, identical in every way) determinations, you will probably obtain a scatter of results.”
9. “We tend to use these two terms (accuracy and precision) interchangeably in our ordinary conversation, but in the context of scientific measurement, they have very different meanings.”

10. “Make sure you thoroughly understand the following essential ideas which have been presented. It is especially important that you know the precise meanings of all the highlighted terms in the context of this topic.”

a) Give examples of random and systematic errors in measurements.

b) State the principal factors that affect the difference between the mean value of a series of measurements, and the "true value" of the quantity being measured.

c) Distinguish between the accuracy and the precision of a measured value, and on the roles of random and systematic error.

11. Finally, examine the concept map. Give the advantages of concept maps.