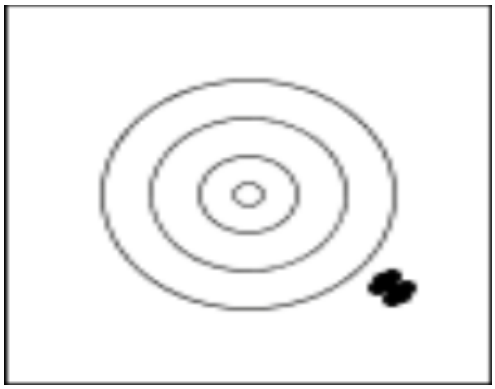
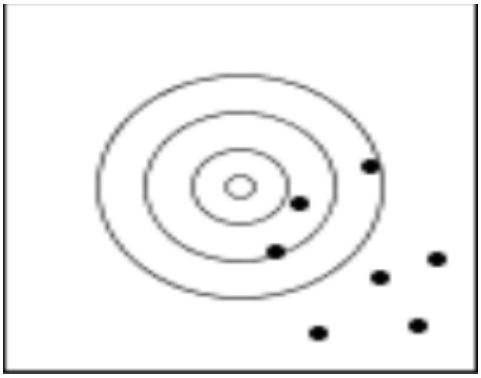
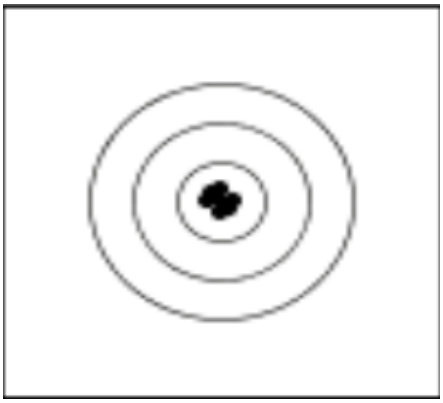
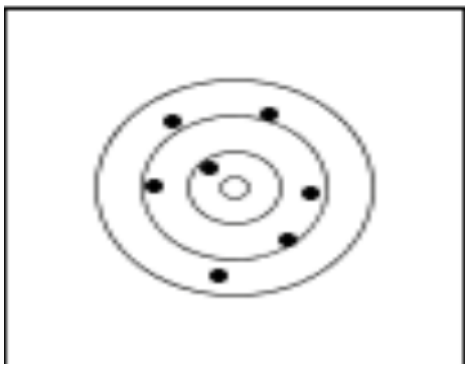
Accuracy - the closeness of measurements to the correct or accepted value of the quantity measured

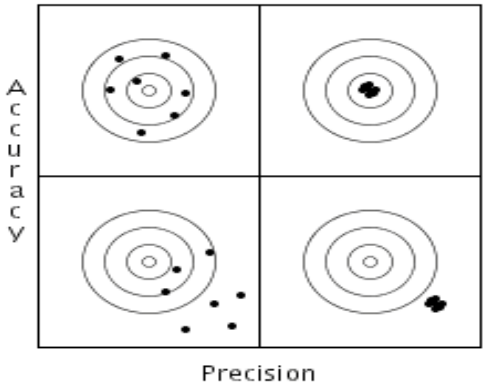
Precision - the closeness of a set of measurements of the same quantity made in the same way











Percent (%) Error

$$\text{Percent Error} = \frac{|\text{Accepted Value} - \text{Experimental Value}|}{\text{Accepted Value}} \times 100$$

Actual

A student measures the mass and volume of a substance and calculates its density as 1.40 g/ml. The correct or accepted value of the density is 1.30 g/ml. What is the percent error in the student's measurement?

Significant Figures

Sig figs

- a measurement that consists of all of the known digits with certainty plus one final digit, which is uncertain or estimated

Rules for determining significant digits

(1) All nonzero digits are significant:

213 →

56.23 →

3.111 →

(2) Zeroes between nonzero digits are significant: "Sandwiched" 0's

101 →

5000203001 →

52003 →

20000002 →

(3) Leading zeros to the left of the first nonzero digits are not significant; such zeroes merely indicate the position of the decimal point:

0.000232 →

0.23 →

0.00000000000001 →

0.00021400200 1 → 5 s.f

(4) Trailing zeroes that are also to the right of a decimal point in a number are significant:

0.0001200 →

10.0000 →

0.00021030000 →

(5) When a number ends in zeroes that are not to the right of a decimal point, the zeroes are not necessarily significant:

2500 →

2500. →

The potential ambiguity in the last rule can be avoided by the use of standard ex or "scientific," notation. For example, depending on whether the number of sig figures is 3, 4, or 5, we would write 50,600 calories as:
5.06×10^4 calories (3 significant figures)
5.060×10^4 calories (4 significant figures), or
5.0600×10^4 calories (5 significant figures).

Addition and Subtraction with significant figures

When adding or subtracting decimals, the answer must have the same number of digits to the right of the decimal point as there are in the measurement having the fewest digits to the right of the decimal point.

ex. 25.1 g + 2.03 g

5.44 m - 2.6103 m

7.91 ml + 8.313 ml

Multiplication and Division with significant figures

- For multiplication and division the answer can have no more significant figures than are in the measurement with the fewest number of significant figures

ex. 3.05 g / 8.47 ml

2.4 g/ml X 15.82 ml

6.2353 g / 4.553 ml