Significant Figures

    A- Why Significant Figures?

    Density example:

Reading the Meniscus at Eye Level

70

eye

60
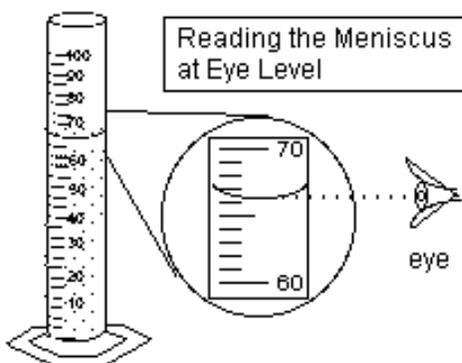
B- Rules for Significant Figures

1.   Measurements should always include one estimated figure. That figure is considered significant.

2. Non-zero digits and captive zeros are always significant.

Example 1 Report the measurement with the correct number of sig figs. Also report the measurement if the bottom of the meniscus was exactly on the 60 ml mark.

Example 2   How many significant figures in the following?

a) 30.004
b) 1.25 X10^3

3. Leading zeros are never significant.
4. Trailing zeros are only significant in the presence of a decimal.

Example3   The police estimated a crowd of 300 000 fans at the Bruins Stanley Cup parade. # of sig figs?

Example 4   High resolution photos from rooftops estimated the crowd to be 277 000. # of sig figs?

Example5   0.0005 ml

5. **Exact numbers have an unlimited number of sig figs.**

Example 6:   What exact numbers are used in chemistry?

6. **When multiplication and division are involved in a series of calculations, the final answer must have as many sig figs as the measurement with the least number of sig figs. (22.4 L/mole, molar masses and 8.31 kPaL/kmole are all measurements.)**
7. **When using molar masses, use *at least as many sig figs* as there are in the other measurements in the problem.**
8. **Only apply rule number 6 in the last step. Keep all decimal places on your calculator in between calculations.**

Example 7:   Find the STP volume of 90.0 g of H_2.

9. **If a calculation only involves adding or subtracting, the answer must have as many decimal places as the measurement with the least decimal places.**

Example 8:   0.00003g + 10.15 g = ????

What is the logic behind this rule?

Exercises

How many significant figures?

1. 0.0004 ml
2. 3.0005 g
3. 900 kg
4. 900. Kg

5. **a) Read the thermometer and report the measurement with the correct number of sig figs.**

   b) What if the line was right on the zero?

Apply the rules of sig figs for the following problems:

1. The volume of a gas at constant pressure increased by a factor of 3.7 when heated. If the original temperature was $37.2^{\circ}C$, find its final temperature in $^{\circ}C$.
2. What is the molar mass of CO if C is given as 12.011 and O is given as 15.9994?
3. What is the density of O_2 at $25^{0}C$ and at 101.3 kPa? This is called SATP instead of STP. If stuck apply STP and a gas law!
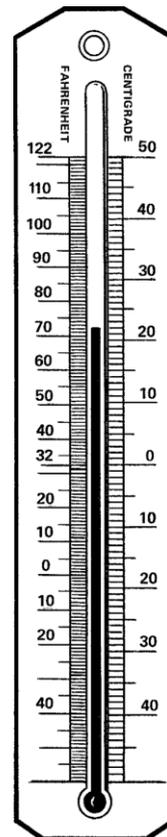
   ### Flashback

   a) Oxygen is a more or less an ideal gas except under certain conditions. Under what conditions of pressure and temperature would its behavior deviate from that of an ideal gas ?

   b) Draw a graph of V vs T in Kelvin for oxygen gas using a broken line, and also draw that of an ideal gas on the same graph.