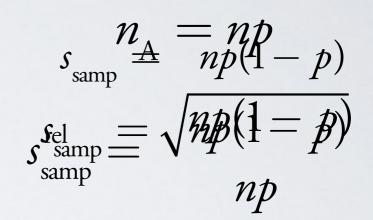
PHYSICAL SAMPLE CONSIDERATIONS CHEM 251 SDSU

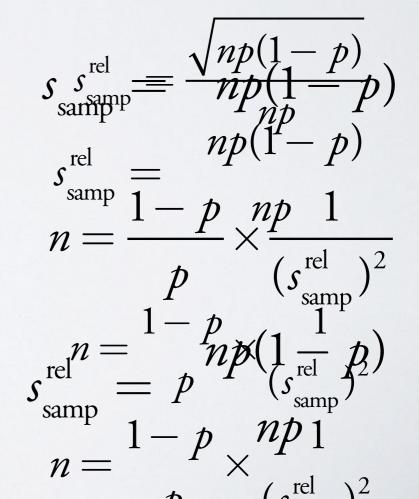
SAMPLE SIZE

- The amount of sample necessary for an analysis is an important consideration for any sample plan.
- If too little sample is taken it can be difficult to identify the presence of any analyte.
- If too much is taken it can be problematic for the analysis.

CALCULATING SAMPL $\frac{n}{n_A} = \frac{n}{n_A} |Z_P|$

- For a given number of particles (n) our analyte (n_A) will occur on a fraction of the time (p).
- With some prior knowledge, or predictions, we can determine the sample size that will be appropriate to get a desired level of relative sampling variance $(s^{rel}_{samp})^2$.





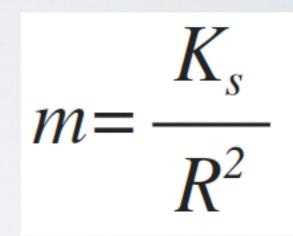
SAMPLE SAMPLE SIZE PROBLEM

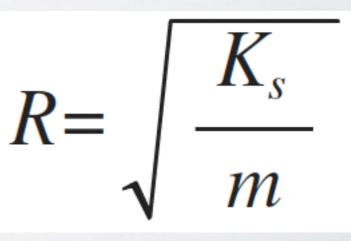
If the content of mercury in a soil sample is estimated to be close to 1×10^{-7} % of the population, how many particles must be sampled in order to obtain a 1% relative sampling standard deviation?

SAMPLE MASS

- The choice of the number of samples to collect is also crucial in obtaining low sample variance.
- If we treat homogeneous solutions as only having two types of particles (analyte and the non-analyte) we approximate a binomial sampling statistics.
- So in a random grab sampling the mass of the sample (m) and the percent relative standard deviation (R) yield a sampling constant (K_s).
- As K_s is a constant for each population we can use it to determine the sample mass (m) required to obtain a desired percent relative standard deviation (R) value.

 $mR^2 = K_s$





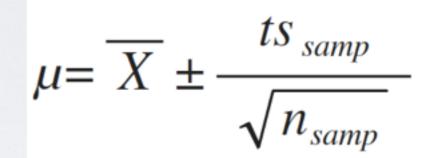
EXAMPLE SAMPLE MASS DETERMINATION

	Sample mass (g)	w/w% Chloride
]	0.5236	33.1
2	0.5264	36.2
3	0.5250	35.7
4	0.5247	34.9
Avg.	0.524925	34.975
STDEV	0.0012	1.3598

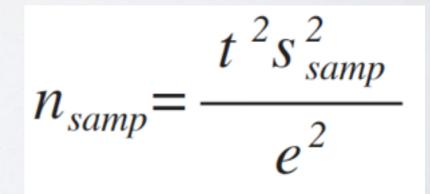
What sample size (mass) is necessary to obtain a percent relative standard deviation for the sampling of $\pm 1.5\%$?

NUMBER OF SAMPLES

- Once we know how large a sample to collect we need to consider <u>how many samples</u> (n_{samp})to collect.
- We can use a desired relative percent sampling error (e) and a desired confidence level to calculate the number of samples.
- The process is an iterative calculation.
- Note e and s_{samp} <u>must be expressed in the</u> <u>same manner</u> (e.g. percent relative standard deviation)



$$e = \overline{X} - \mu$$



SAMPLE NUMBER PROBLEM

From the prior problem we determined that a sample mass of 3.522g to have a percent relative standard deviation of $\pm 1.5\%$.

How many samples need to be collected to to have a percent relative sampling error (e) of $\pm 1.0\%$ at the 95% confidence level?