Questions from McCurdy Chapter

6. Outline and briefly describe the major steps in a chemical method.

See figure 1-1

8. Four specific terms are applied to describe a range of concentration of a component in a sample. What are these terms and what approximate range of concentrations would be expected to correspond to each?

major (>1%), minor (0.01-1%), trace (10-2 – 10-6%), or ultra-trace (10-6- 10-9%)

9. Accuracy is important in an analytical method. In what ways can the accuracy of an analytical method be measured?

Ideally, a comparison to known samples would be used (SRMs??). Assuming the absence of systematic errors, the confidence limit is usually a reasonable estimate of accuracy.

10. What is the typical measure of precision in an analytical method? Be specific.

The variance (s^2) is the best measure of precision, however we typically have a small enough data set that the sample standard deviation is used instead.

15. Name at least four different important considerations in the collection of a sample for analysis and in its reduction from a gross sample to a laboratory sample.

Terms you could include are: representative sampling, sample stability, sample storage and transport, sample homogeneity, sample pretreatment and others.

17. What is the purpose of a blank in a chemical measurement?

The blank indicates the contribution of non-analyte components of the sample to the measurement.

Questions from Robinson Text

1.6	**True Value =**	0.1026	g	**Deviation**
	Data	0.1021	g	0.0005
		0.1025	g	0.0001
		0.1019	g	0.0007
		0.1023	g	0.0003
	Mean =	0.1022	g	
	Average Deviation =	0.0004	g	
	St. Dev =	0.000258	g	
	%RSD =	0.253	%	
	Absolute Error of Mean =	0.0004	g	

1.9	**Data**	2.09	ppm	
		2.09	ppm	
		2.11	ppm	
		2.12	ppm	
		2.13	ppm	
		2.13	ppm	
		2.15	ppm	
		2.17	ppm	
		2.17	ppm	
		2.51	ppm	
	a) Mean =	2.167	ppm	
	b) St. Deviation =	0.12	ppm	
	c) 95% CI	t = 2.26 for 9 degrees of freedom		
	range =	0.0885		
	CI =	2.17	± 0.09	ppm
	d)	2.51 seems out of range		
	Average w/out 2.51 =	2.13	ppm	
	St. Dev w/out 2.51 =	0.030	ppm	
	Average + 4 sigma =	2.25	ppm	
		So, 2.51 should be omitted		

1.12 **a)** The data are not greater than 2.5 ppm. Even with the outlier, the upper limit for the 95% CI is 2.35 ppm

b) The results are greater than 2.0 ppm, even with the outlier omitted (2.13 ppm).

1.21	**Data**	XRF		ICP	
		3.07	%	2.92	%
		2.98	%	2.94	%
		2.99	%	3.02	%
		3.05	%	3.00	%
		3.01	%	2.99	%
		3.01	%	2.97	%
	Mean	3.018	%	2.973	%
	St. Dev.	0.035	%	0.038	%
	s_{pooled} =	0.036355			
	t_{calc} =	2.143938			
	t_{table} (10 d.o.f) =	2.23			

Since $t_{calc} < t_{table}$, the results are not statistically different.

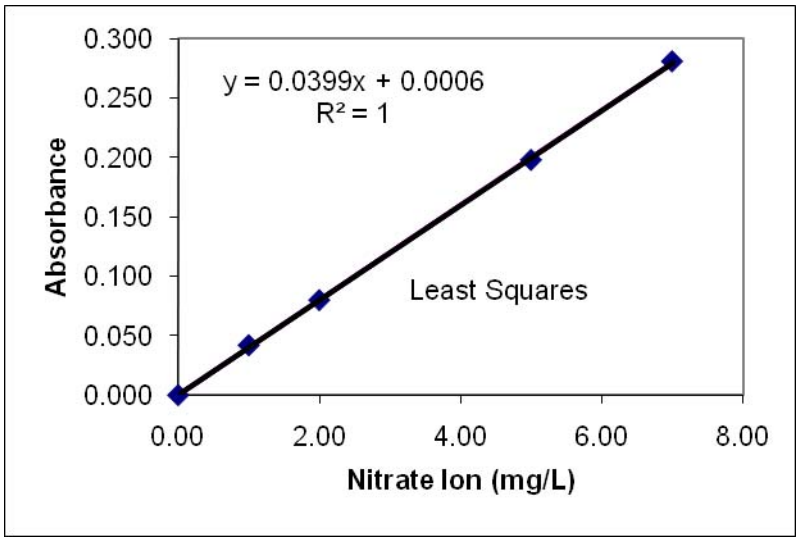
95% CI for ICP data = 2.97 ± 0.04 %

Since all but one of the ICP values are lower than that for the XRF, it is possible that there is bias in the measurement, but the precision of each method is poor enough to make this judgement shaky.

1.25 **Data**

Conc.	Abs.
0.00	0.000
1.00	0.042
2.00	0.080
5.00	0.198
7.00	0.281

a)



b) Absorbance = 0.0399(Nitrate ion) + 0.000553
c) s_{slope} = 0.00029 mg/L, $s_{intercept}$ = 0.00114 (You should review your Quant material to see how to calculate these)
d) R^2 = 1, so R ~1 also

1.31 **Data**

	0.23	ppb	0.09	ppb
	0.14	ppb	0.1	ppb
	0.16	ppb	0.2	ppb
	0.28	ppb	0.15	ppb
	0.18	ppb	0.21	ppb
Average	0.17	ppb		
St. Dev	0.059	ppb		

a) LOD @ 95% 0.29 ppb
LOD @ 99% 0.35 ppb

1.32 The LOQ is typically defined as the concentration corresponding to a signal that is ten times the standard deviation of the blank.

LOQ = 0.76 ppb