Chem M3LC.
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Statistics Example: The Discovery of Argon.

In 1894, Lord Rayleigh lectured the Royal Society on the difference in the weight of Nitrogen gas derived from chemical and atmospheric sources. This difference was explained in terms of a new, hitherto undiscovered element. Sir William Ramsay (an Analytical Chemist who worked for Bunsen) later isolated this element, which he called Argon.

Here is the data that Lord Rayleigh presented:

Atmospheric Nitrogen:

2.3103g	by hot copper
2.3100	by hot iron
2.3102	by ferrous hydrate
2.3102	mean

Chemical Nitrogen:

2.3001g	from nitric oxide
2.2990	from nitrous oxide
2.2987	from ammonium nitrite purified at red heat
2.2985	from urea
2.2987	from ammonium nitrite purified in the cold
2.2990	mean

If Lord Rayleigh were a Chem M3LC student, he would report the data with 95% confidence intervals as shown on the next page.

(Also included in the spreadsheet is a calculation of the comparison of two experimental means)

	A	B	C	D	E	F	G
1	Argon Calc	Weight					
2							
3	A. Atmospheric	3	samples (NA)				
4							
5		2.3103	g				
6		2.3100					
7		2.3102					
8							
9		2.3102	x-bar (xA)				
10		0.0002	std dev (s)				
11		2	dof				
12		4.3000	t factor				
13		0.0004	95% C. L.				
14							
15	Weight (xA)	2.3102	±	0.0004	g (95% CL)		
16							
17	B. Chemical	5	samples (NB)				
18							
19		2.3001	g				
20		2.2990					
21		2.2987					
22		2.2985					
23		2.2987					
24							
25		2.2990	x-bar (xB)				
26		0.0006	std dev (s)				
27		4	dof				
28		2.7800	t factor				
29		0.0008	95% C. L.				
30							
31	Weight (xB)	2.2990	±	0.0008	g (95% CL)		
32							
33	Comparison of two experimental means						
34	Weight (A-B)	0.0112	g				
35		0.0005	pooled std dev (sp)				
36							
37		6	dof: NA + NB - 2				
38	t(calc) =	28.84			tcalc = (xA-xB)/sp*sqrt(NA*NB/(NA + NB)		
39	t(table) =	2.45	95% C. L.				
40							
41	if t(calc)> t(table) - the two numbers are statistically different.						