

7. You have run a series of titrations to determine the unknown concentration of KHP in a solid sample. The results of titrations indicate KHP concentrations of 36.14%, 35.69%, 30.15%, 35.55%, 36.07%, 35.98%. The "true" value for KHP in this sample is 36.29%. Evaluate the data and determine if your results differ from the true value at the 95% confidence level.

8. Nitrite (NO_2^-) was measured in rainwater and unchlorinated drinking water using replicate measurements of a single sample by an established spectrophotometric method. Based on the results below, does drinking water sample contain significantly more nitrite than rainwater sample (at the 95% confidence level)?

Replicate	1	2	3	4	5
Rainwater (ppb)	55.1	59.6	63.1	66.4	71.5
Drinking Water (ppb)	74.6	81.0	87.3	91.8	93.2

Possibly Useful Information

$m = \frac{m \left(1 - \frac{d_a}{d_w} \right)}{\left(1 - \frac{d_a}{d} \right)}$	<p>Density of air = 0.012 g/ml Density of balance weights = 8.0 g/ml</p>
$\mu = \bar{x} \pm \frac{ts}{\sqrt{n}}$	$y = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/2\sigma^2}$
$e_c = \sqrt{e_A^2 + e_B^2}$	$e_c = C \sqrt{\left(\frac{e_A}{A} \right)^2 + \left(\frac{e_B}{B} \right)^2}$
$t_{\text{calculated}} = \frac{ \text{known value} - \bar{x} }{s} \sqrt{n}$	$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$
$t_{\text{calculated}} = \frac{ \bar{x}_1 - \bar{x}_2 }{S_{\text{pooled}}} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$	$S_{\text{pooled}} = \sqrt{\frac{s_1^2(n_1 - 1) + s_2^2(n_2 - 1)}{n_1 + n_2 - 2}}$
$t_{\text{calculated}} = \frac{\bar{d}}{s_d} \sqrt{n}$	$s_d = \sqrt{\frac{\sum (d_i - \bar{d})^2}{n-1}}$
$s_x = \frac{s_y}{ m } \sqrt{\frac{1}{k} + \frac{1}{n} + \frac{(y - \bar{y})^2}{m^2 \sum (x_i - \bar{x})^2}}$	$s_y = \sqrt{\frac{\sum (d_i - \bar{d})^2}{n-2}} = \sqrt{\frac{\sum d_i^2}{n-2}}$
$s_m^2 = \frac{s_y^2 \times n}{D}$	$s_b^2 = \frac{s_y^2 \sum x_i^2}{D}$
$y_{\text{LOD}} = y_{\text{blank}} + 3s$	$F_{\text{calculated}} = \frac{(s_1)^2}{(s_2)^2}$
$Q_{\text{calculated}} = \frac{\text{gap}}{\text{range}}$	$G_{\text{calculated}} = \frac{ \text{suspect value} - \bar{x} }{s}$

Values of Student's t

Degrees of Freedom	Confidence Level (%)			
	90	95	99.5	99.9
1	6.314	12.706	127.32	636.61
2	2.920	4.303	14.089	31.598
3	2.353	3.182	7.453	12.924
4	2.132	2.776	5.598	8.610
5	2.015	2.571	4.773	6.869
6	1.943	2.447	4.317	5.959
7	1.895	2.365	4.029	5.408
8	1.860	2.306	3.832	5.041
9	1.833	2.262	3.690	4.781
10	1.812	2.228	3.581	4.587
∞	1.645	1.960	2.807	3.291

Values of Q for rejection of data

# of Observations	Q (90% Confidence)
4	0.76
5	0.64
6	0.56

Grubbs Test for Outliers

# of Observations	G _{critical} At 95% confidence
4	1.463
5	1.672
6	1.822

Critical Values of F at the 95% Confidence Level

Degrees of freedom for s ₂	Degrees of freedom for s ₁								
	2	3	4	5	6	7	8	9	10
2	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4
3	9.55	9.28	9.12	9.01	8.94	8.89	8.84	8.81	8.79
4	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96
5	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74

PERIODIC CHART OF THE ELEMENTS

IA	IIA	IIIB	IVB	VB	VIB	VIIIB	VIII	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA	INERT GASES	
1 H 1.00797															1 H 1.00797	2 He 4.0026	
3 Li 6.939	4 Be 9.0122										5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183	
11 Na 22.9898	12 Mg 24.312										13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948	
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	*57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	†89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ? (271)	111 ? (272)	112 ? (277)						

Numbers in parenthesis are mass numbers of most stable or most common isotope.

Atomic weights corrected to conform to the 1963 values of the Commission on Atomic Weights.

The group designations used here are the former Chemical Abstract Service numbers.

* Lanthanide Series

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97
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† Actinide Series

90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (258)	102 No (258)	103 Lr (257)
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