

Answer on Question #65094 - Chemistry - General Chemistry

Question: A student obtained the following values for the percentage of Br in a bromide sample: 21, 20, 22, 20, and 19. What should be reported as the best estimate of the Br content of the unknown sample?

Solution

1) Find the mean value of the obtained results:

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n} = \frac{21 + 20 + 22 + 20 + 19}{5} = 20.4\%$$

2) Find the standard deviation (SD or simply S) for the series of the results:

$$\begin{aligned} S &= \sqrt{\frac{\sum_{i=1}^n |x_i - \bar{x}|^2}{n - 1}} \\ &= \sqrt{\frac{|21 - 20.4|^2 + |20 - 20.4|^2 + |22 - 20.4|^2 + |20 - 20.4|^2 + |(19 - 20.4)|^2}{4}} \\ &= 1.1402\% \end{aligned}$$

3) The Student's coefficient (t) for n=5 and the confidence level P=0.95 is 2.776 (table value). The deviation of the mean value in the results should be given as

$$\Delta x = \frac{t * S}{\sqrt{n}} = \frac{2.776 * 1.1402}{\sqrt{5}} \approx 1.4\%$$

4) The estimate of the Br content in the sample should be given as $\bar{x} \pm \Delta x$: the content of Br in the sample is 20.4±1.4 %.

Answer: the content of Br in the sample is 20.4±1.4 %.

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