

This exercise should be completed using a spreadsheet. You should save your work (computer file), as it will be useful for a future laboratory experiment. **Submit this sheet with appropriate attachments**, including a plot of turbidity vs. concentration with the experimental points and the best fit line, your regression analysis results, and your calculations for parts c and d, with annotations referring to parts a-d. (*Presentation of the detailed intermediate calculations to obtain the equation for the regression line is not required. However, do show the equations and calculations for computation of the confidence interval.*)

|   | $c_x$<br><u>mg SO<sub>4</sub><sup>2-</sup>/L</u> | <u>Turbidity</u> |
|---|--|------------------|
| The sulfate concentration in a natural water sample was determined by measuring the turbidity that resulted when an excess of BaCl <sub>2</sub> was added to a measured quantity of the sample. A turbidimeter, the instrument used for this analysis, was calibrated with a series of standard Na <sub>2</sub> SO <sub>4</sub> solutions treated in the same fashion. The data for the calibration standards are given in the table. | 0.00   | 0.03             |
|   | 5.00   | 1.28             |
|   | 10.00  | 2.63             |
|   | 15.00  | 3.86             |
|   | 20.00  | 5.21             |

Assume that there is a linear relationship between the instrument reading and concentration. **For the following questions, attach sheets showing your work and summarize results below, as appropriate.**

- (a) Determine the least-squares equation for the relationship between the variables, i.e., *Turbidity* =  $f(c_x)$ , and write the equation here clearly and explicitly in terms of *Turbidity*,  $c_x$ , and the numerical values of the constants (eg:  $Turbidity = 5.46c_x + 0.06$ ).

Equation:

- (b) Generate a plot showing the experimental data points and best-fit line (attach)
- (c) Calculate the concentration ( $c_x$ ) of sulfate in a sample yielding a **single turbidimeter reading** of 3.62. Calculate the absolute standard deviation ( $s_c$ ) of the result and the 95% confidence interval (*CI*).

$$c_x = \text{_____ mg SO}_4^{2-}/\text{L}; \quad s_c = \text{_____ mg SO}_4^{2-}/\text{L}; \quad CI = \text{_____}$$

- (d) Repeat the calculations assuming that the sample turbidity reported in (c) was the **mean of six turbidimeter readings**.

$$s_c = \text{_____ mg SO}_4^{2-}/\text{L}; \quad CI = \text{_____}$$

Please attach your annotated Excel worksheet(s) and sign the statement of authorship below.

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#### STATEMENT OF AUTHORSHIP

The work presented above and on the attached materials is my own. Although this work may be based on examples provided in class and on assistance from others, it is substantially my own work, and the worksheets and graphs were created by me.

Signed \_\_\_\_\_ Date \_\_\_\_\_