Worksheet 12: Quality Assurance

1. An environmental chemist working for the EPA collected razor clams from a contaminated river and analyzed them for their cadmium content. The collected clams were freeze-dried and blended, resulting in about 50 g of homogenized dry weight. 51.00 mg of this sample were taken and dissolved in 100.00 mL of 0.1 M HCl to create a sample solution. Using the method of standard additions, 5 standard solutions were prepared in 100 mL volumetric flasks, each containing 5.00 mL of the sample solution and varying amounts of 85.0 ppb cadmium. The standard solutions were then brought to volume with 0.1 M HCl. The results of this analysis are shown in the table below.

Sample volume (mL)	Cd^{2+} standard volume (mL)	Cd^{2+} standard mass (μg)	Absorbance
5.00	0.00	0.000	0.080
5.00	5.00	0.425	0.163
5.00	7.50	0.638	0.200
5.00	10.00	0.850	0.241

(a) Determine the amount of cadmium per gram of dry clam weight. Express your final result as a weight percent.

(b) Find the absolute uncertainty (standard deviation) of the measurement.

(c) Determine the 95% confidence interval of the measurement.

2. A scientist wishes to measure the concentration of methyl benzoate in a plant stream by gas chromatography. He prepares a sample of butyl benzoate to use as an internal standard. The results of a preliminary run using a known solution containing 1.97 mg/mL of methyl benzoate (peak A) and 2.17 mg/mL of butyl benzoate (peak B) showed an area of 367 for peak A and 425 for peak B. To measure the sample, 1.00 mL of a standard containing 2.13 mg/mL of butyl benzoate was mixed with 1.00 mL of the plant stream material. Analysis of the mixture gave a peak area of 437 for peak A and 401 for peak B.

(a) What is the concentration of methyl benzoate in the plant stream?