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# Application Note

## ISE - Dilutions

The following is general information regarding dilutions.

**Required Information:**

- What concentration is the stock solution?
- What is the volume of the required standards?
- What is the volume of the volumetric flask being used for the dilution?
- What are the volumes of the Class A pipettes?

**Calculation Formula:**

(Concentration A) (Volume A) = (Concentration B) (Volume B)
where:
Concentration A - the concentration of the stock solution
Volume A - the amount of stock solution needed for the dilution
Concentration B - the concentration needed
Volume B - the volume of the volumetric flask used for the dilution

**Example:**

Concentration of stock solution: 1000 ppm (Concentration A)
New standard: 10 ppm (Concentration B)
Volumetric flask: 100 mL (Volume B)

(1000 ppm) (Volume A) = (10 ppm) (100 mL)
Volume A = 1 mL of the stock solution

So, for this example, to make a 10 ppm standard, add 1 mL of the 1000 ppm standard to a 100 mL volumetric flask. Add DI water to mark. Mix by inversion.

**Types of Dilutions:**

- Serial dilution – All standards are made by diluting the previous standard. Example: The 100 ppm is made form the 1000 ppm. The 10 ppm is made from the 100 ppm.
- Non-serial dilution - Where all standards are diluted from the stock solution. Example: The 100 ppm and 10 ppm are made from the 1000 ppm.

Always use serial dilution for making standards. Non-serial dilutions can be used as check values, as this will catch dilution errors.

**Recommendations:**

- Use Class A glassware
- Volume A to Volume B ratio should be within two factors of ten. This will reduce the dilution error
- Dilute up to the volume of the volumetric flask
- Mix well before making another dilution with this new standard