Understanding Molar Concentrations
And how they are used to make standard solutions…

One mole of a compound has 6.02×10^{23} molecules of that compound.
One mole of a compound is also its molecular weight in grams. A one molar (1.0 M) solution has 1 mole of a solute dissolved in 1000mL (1L) of solvent.

For example, the molecular weight of NaCl is 58.44 g/mol. Therefore,

1.0 M solution of NaCl has 58.44 g of NaCl in 1 L, or, 5.844 g diluted in 100 mL, etc.
0.1 M solution of NaCl has 5.844 g of NaCl in 1 L, or 0.5844 g in 100 mL, etc.
0.2 M solution of NaCl has 11.68 g of NaCl in 1 L, or 1.168 g in 100 mL, etc.

What if you are asked to make a 1000 mg N/L solution from a known solid that contains N (e.g. KNO_3)

1. Determine the molar weight of KNO_3

Element	Molar wt	Number of atoms	Total weight
K	39.098	1	39.098
N	14.007	1	14.007
O	15.999	3	47.997
Total			101.102

2. Therefore,

$$\frac{1000mg\ N}{L} * \frac{1g}{1000mg} * \frac{101.102\ g\ KNO3}{14.007\ g\ N} = 7.218\ g\ KNO3$$

To make 1000 mg N/L stock solution from KNO3, dissolve 7.218 g of KNO_3 (previously oven-dried at 105 C for 1 hr) in 1000mL of deionized water.

Test yourself:

1. How many g of $NaNO_3$ would you need to make 1 L of 1000 mg NO_3-N/L solution?

2. How many g of NH_4Cl do you need to make 1 L of 1000 mg NH_4-N/L solution?