

Understanding the Chemical Certificate of Analysis

The Certificate of Analysis (C of A) should be reviewed by the pharmacist (and be readily retrievable) before a chemical is placed in inventory. When calculating the weight required for a given formula all of the following should be accounted for:

1. Purity – expressed as the assay (% less than 100) on the certificate of analysis
2. Salt conversions – i.e. hydrochloride, benzoate, pamoate
3. Water content - expressed on the C of A as Water or Loss on Drying (LOD)
4. Unit conversion – i.e. IU per mg

Examples

1. Purity – if purity is less than 100% the weight added must be adjusted. For example, to weigh an API that has an assay of 97%, the following calculation should be made:
$$\frac{5.0 \text{ g} \times 100\%}{97\%} = 5.155 \text{ g}$$
when weighed will provide 5.0 g of the API.

2. Salt conversions – some APIs require a salt conversion to obtain an accurate weight of the active component. Check USP and appropriate references to determine how potency is measured for a specific API. For example Epinephrine HCl, USP potency is determined by the potency of Epinephrine as the hydrochloride salt.

Example: The molecular weight of Epinephrine HCl, USP (219.67) divided by the molecular weight of Epinephrine (183.20) = 1.19907 – a factor of 1.199 is used to account for the HCL salt.

3. Water Content – water content is expressed on the C of A as either 'water' or LOD (Loss on drying).
Example: Lidocaine HCl, USP contains from 6 to 7% water. To account for this calculation:
 $100\% - 6\% (\text{water}) = 94\% \text{ active}$. $100\% \text{ divided by } 94\% = 1.0638$. Apply a factor of 1.063.
4. Unit calculations – some API potencies are expressed as units (or IU) per mg (or g). To compound a solution of Heparin 50,000 units (total) using Heparin Sodium, USP with a potency of 204.2IU/mg, divide 50,000units by 204.2 units/mg =245mg. Heparin Sodium, USP also has water content of 1.3% (98.7%) – to account:
 $245\text{mg}/0.987 = 248\text{mg}$.

See USP Chapter <1160> - for a formula to calculate the amount of drug to be weighed: $W = ab/de$, where W is the actual weighed amount; a is the prescribe weight of the active drug; b is the chemical weight of the ingredient; d is the fraction of dry weight when the percent of moisture is known from LOD; and e is the formula weight of the active drug provided by the weighed ingredient.

Source: USP Chapter <1160>