

## PRIMARY STANDARDS

A standard solution is a solution whose concentration is accurately known. Standard solutions may be prepared from **primary standards**; chemical species that are so pure, that the amount (in mol) of substance can be accurately determined from its mass.

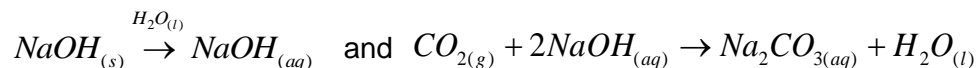
### *Properties of Ideal Primary Standards*

- Be readily available in pure form.
- The molecular formula must be known and cannot vary. **For example:** The species cannot absorb substances from the air, or give off substances to the atmosphere.
- Be easily stored without deteriorating or reacting with the atmosphere.
- Must be soluble under the conditions in which it is to be used.
- Should have a high molecular weight so that weighing errors are minimised.
- Must react rapidly and completely with the analyte.
- Must react stoichiometrically with the analyte.
- Must be selective for the analyte.

### *The following substances are NOT suitable primary standards:*

- Solid  $NaOH$

In the case of solid  $NaOH$ , the molecular weight is not accurately known.  $NaOH$  is deliquescent (absorbs moisture from the air) and absorbs  $CO_2$  from the atmosphere.



- $HNO_3$  and  $H_2SO_4$

These acids absorb  $H_2O$  from the atmosphere and therefore, the molecular weights are not accurately known.

- Hydrated sodium carbonate

The loosely bound water molecules can evaporate, hence the molecular weight is not accurately known.

## **PREPARING STANDARD SOLUTIONS**

- Step 1:** Calculate the mass of primary standard required to make a solution of a specific concentration.
- Step 2:** Weigh out an accurately known mass of a primary standard.
- Step 3:** Carefully transfer the weighed mass from the crucible into a volumetric flask. Gently rinse the crucible to ensure that the entire sample is transferred into the flask.
- Step 4:** Add some distilled water to the volumetric flask and mix the solution carefully.
- Step 5:** Make the solution up to an accurately known volume.
- Step 6:** Calculate the concentration.

**When a standard solution has been used to determine the concentration of a solution, we say that the solution has been standardised.**