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| Standard Operating Procedure for:**Standard solution preparation 1** | PPE required: |
| **This method uses a volumetric flask to prepare standard solutions.** All solution containers should be carefully labelled with your name, date of production and what is in the solution and the concentration.**Standard solution:** A solution of accurately known concentration, prepared using standard substances. Concentrations may be expressed in kmol/m–3, mol/dm–3, or ppm (ppb). **Stock solution:** A concentrated solution that is used to prepare the diluted standard solutions which are used to calibrate analyses. You should always check this has been stored appropriately.**This SOP covers general solution production but not chemicals. You must carry out a risk assessments for the chemicals (stock solutions) you are using before commencing work.** |
| **Protocol for making standard solutions from a stock solution**Always use acid-washed class “A” glassware and certified pipettes. It is good practice to check the volumes of the glassware and the amount delivered by pipettes using Milli-Q water and a balance. This is especially true if you use variable pipettes. It is also a good idea to make large volumes as there is a higher margin of error. Use analytical reagent grade chemical (e.g. Aristar or Analar or equivalent).1. Pre-rinse a volumetric flask 3 times using Milli-Q water. Keep stoppers on flasks except when adding water or reagents. Never put stoppers lay down on the table.
2. Add Milli-Q water into the volumetric flask (approx. 2/3 full).
3. Pre-rinse a beaker medicine cup with stock solution 2 times and then add stock solution. **Never put pipettes into the stock solution.** If the stock solution has been stored in a fridge, give it time to reach room temperature.
4. Pre-rinse pipettes or pipette tips 2 times with the stock solution taking it from the beaker.
5. Take the exactly the amount needed into the volumetric flask and touch end of the pipette to the wall of the volumetric flask when delivered is complete.
6. Add Milli-Q water until just below the meniscus line and then make up to volume with the bottom of the meniscus of the solution on meniscus line using a Pasteur pipette.
7. Mix thoroughly.
8. Store the standard solution in a **labelled** reagent bottle (not in a volumetric flask).
9. Discharge any stock solution as appropriated. Never put it back into the stock solution bottle.

**Protocol for making stock solutions from a highly quality pure solid reagent**1. Dry the solid reagent on a clean, oven dried, watch glass at 105 ºC for 2 hours and cool it in a desiccator.
2. Pre-rinse volumetric flasks 3 times using Milli-Q water. Keep stoppers on flasks except when adding water or reagents. Never put stoppers ‘nose’ down on the table.
3. Weight the exact amount in a tared weighting boat (take into account purity grades in the calculation). The concentration of the stock solution should be specified in the method.
4. Carefully transfer the weighted chemical to a funnel placed on a volumetric flask. Wash the weighting boat with small portions of Milli-Q water.
5. Add Milli-Q water into the volumetric flask up to half of volume and swirl to dissolve. Never heat a volumetric flask to aid dissolution. If the reagent needs heat then carry out this step in an acid cleaned beaker or equivalent.
6. Continue the addition of Milli-Q water until just below the meniscus line and make up to volume using a Pasteur pipette (as above).
7. Mix thoroughly.
8. Store the standard solution in a **labelled** reagent bottle (not in a volumetric flask). The storage conditions should be specified in the method.
 | **Hazard symbols:**See individual experiment risk assessments |
| **Significant hazards:**See above |
| **Hazard phrases (H):**See above |
| **Can it be done out of hours?**Standard solutions can be prepared out of hours **provided they have been included in an out of hours risk assessment.**  |
| **This SOP is not relevant in the following circumstances:**1. SOP does not cover specific experimental risk these must be covered by user’s assessments
2. Any other situation where the procedure may result in harm to yourself or others.
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| Standard Operating Procedure for:**Standard solution preparation 2** | PPE required: |
| **This method uses centrifuge tubes, not volumetric flasks, to prepare standard solutions.** All solution containers should be carefully labelled with your name, date of production and what is in the solution and the concentration.**Standard solution**: A solution of accurately known concentration, prepared using standard substances. Concentrations may be expressed in kmol/m–3, mol/dm–3, or ppm (ppb). **Stock solution**: A concentrated solution that is used to prepare the diluted standard solutions which are used to calibrate analyses. You should always check this has been stored appropriately.**This SOP covers general solution production but not chemicals. You must carry out a risk assessments for the chemicals (stock solution) you are using before commencing work.** |
| **Protocol for making standard solutions from a stock solution**Always use certified pipettes and unused or acid washed cleaned centrifuge tubes. It is good practice to check the amount delivered by pipettes using Milli-Q water and a balance. This is especially true if you use variable pipettes. It is also a good idea to make large volumes as there are fewer margins for error. Use analytical reagent grade chemical (e.g Aristar or Analar or equivalent).1. Pre-rinse a beaker or medicine cup with stock solution 2 times and then add stock solution. Alternatively use a clean. **Never put pipettes into the stock solution.** If the stock solution has been stored in a fridge, give it time to reach room temperature.
2. Pre-rinse pipettes or pipette tips 2 times with the stock solution taking it from the beaker.
3. Take the exactly the amount needed into the centrifuge tube.
4. Using a clean pipette tip add the appropriate amount of Milli-Q water.
5. Mix thoroughly and then **label the centrifuge tube**
6. Store the standard solution in a **labelled** reagent bottle (not in a volumetric flask).
7. Discharge any stock solution as appropriated. Never put it back into the stock solution bottle.

**Protocol for making stock solutions from a highly quality pure solid reagent**1. Dry the solid reagent on a clean, oven dried, watch glass at 105 ºC for 2 hours and cool it in a desiccator.
2. Weight the exact amount in a tared weighting boat (take into account purity grades in the calculation). The concentration of the stock solution should be specified in the method.
3. Carefully transfer the weighted chemical into the centrifuge tube.
4. Add the appropriate amount of Milli-Q water to the centrifuge tube using some of the water to wash the weigh boat if necessary.
5. Mix thoroughly.
6. Store the standard solution in a **labelled** reagent bottle (not in a volumetric flask). The storage conditions should be specified in the method.
 | **Hazard symbols:**See individual experiment risk assessments |
| **Significant hazards:**See above |
| **Hazard phrases (H):**See above |
| **Can it be done out of hours?**Standard solutions can be prepared out of hours **provided they have been included in an out of hours risk assessment.**  |
| **This SOP is not relevant in the following circumstances:**1. SOP does not cover specific experimental risk these must be covered by user’s assessments
2. Any other situation where the procedure may result in harm to yourself or others.
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