



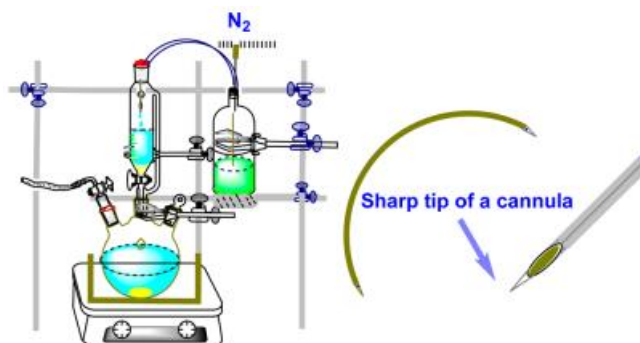
SOP: REUSABLE NEEDLES AND CANNULAS

Cannulas and needles (sharps) are frequently used for transferring liquid chemicals, especially those that are air/moisture sensitive under inert conditions. Needle sticks are often one of the most common lab injuries, and while the majority are minor, needle sticks can cause harmful chemical exposure which lead to further injuries.

The sharp points of reusable needles and cannulas can pose a constant danger and so extra caution needs to be taken particularly for their cleaning and storage.

Reusable Stainless-Steel Needles: Reusable stainless-steel needles are available in various lengths and bore sizes. They require immediate cleaning after uses to avoid blockages, especially when used for reactive reagent transfers. Needles can be dried in an oven to remove any surface moisture after cleaning. While generally less sharp than disposable needles, reusable needles are still quite sharp and must be handled and disposed of as sharps.

Stainless-Steel Cannulas: Stainless-steel cannulas (double-tipped needles) are useful for transferring moisture-sensitive and pyrophoric chemicals at larger scales. A cannula is a long, thin metal tube with a needle on both ends. When the reagent is in a suspension, use a large bore size cannula for reagent transfer to prevent clogging. The cannula used for the chemical transfer should be long enough to make a connection between the reagent container and a reaction vessel. Avoid excess bending of cannulas; however, slight bending will not cause breakage. Stabbing can occur from cannulas while inserting into septa and while cleaning and storing them.



Information Reference and additional information: Chandra, T et al; *ACS Chem. Health Saf.*, 2022 (<https://doi.org/10.1021/acs.chas.1c00069>)

Transfer via cannulation can either be performed by reducing the pressure in the container which the liquid is being transferred into (referred to as negative pressure) or by increasing the pressure in the vessel containing the reagent (referred to as positive pressure). For assistance with performing cannula transfers please contact your SHE Rep.



HEALTH & SAFETY ISSUES

Needle sticks are one of the most common laboratory incidents. The most basic way to increase needle safety and avoid needlestick injuries is to use blunt ended needles wherever possible. Though blunt ended needles are not suitable for injecting liquid through septa, they have numerous other uses including measuring liquid, transferring liquid between vessel, and applying adhesives. However, following the procedures described below chemists should be able to use reusable needles without incident.

Safe Handling of Cannula and Needles:

- Assemble and safely secure glassware and apparatus inside a properly working and uncluttered chemical fume hood before transferring any chemicals using a needle or a cannula.
- Inspect syringes and needles thoroughly before use to make sure they are not leaking or clogged.
- Use a properly sized, clean syringe and needle/cannula for chemical or solvent transfer.
- Avoid using needles that are visibly bent (curves are acceptable).
- Avoid using plastic syringes with a rubber plunger for chlorinated solvents; plastic generally reacts with chlorinated solvents.
- Use syringes only for small-scale transfers (<50 mL) and use special precautions when transferring pyrophoric chemicals using syringes.
- Syringes should **not** be filled at or more than half capacity so the plunger does not accidentally come out especially for pyrophoric reagents.
- Syringes with greater capacity than 10 mL should **not** be used to handle pyrophorics.
 - Large syringes are awkward and require excessive force to operate.
 - It is very easy to accidentally pop out the plunger on a large syringe causing burning pyrophoric liquid to spill on the individual (NOTE: An accident of this type resulted in a death at the University of California, Los Angeles in 2008).
- When transferring chemicals that are air/moisture reactive, it is advisable to use a cannula or syringe only once for a single transfer. Multiple transfers should use fresh transfer equipment. Failure to follow this can result in clogged needles and frozen syringes. Needles/syringes should be washed immediately.
- Special precautions are needed while manipulating pyrophoric chemicals using needles and cannulas.
 - Larger volumes of pyrophoric liquids should be measured by cannulating the material in and out of a measuring cylinder under inert atmosphere.



In practice:

- Carefully assemble needle and syringe (NOTE: Use a Luer lock syringe where appropriate - this will prevent the needle from popping off).
- Carefully remove the cap from the needle.
- Keep hands and body away from the sharp end of the needle and not in the “line of fire”. Ensure both hands are behind the plane of the needle.
- Extract the necessary volume by slowly pulling back the plunger (NOTE: Take extreme care not to withdraw the plunger too far if handling hazardous liquids (e.g., pyrophorics).
- When dispensing liquid, avoid excessive pressure on the plunger which may cause the needle to pop off.
- Dispose of the uncapped syringe and needle in the appropriate sharps waste container immediately following use.
- Do NOT re-cap needle (NOTE: if recapping is absolutely necessary see below).

Recapping Needles:

Needles should not be recapped, bent, removed, or otherwise manipulated by hand. It is very easy to stick your hand while recapping needles, and the needle being recapped may be contaminated with hazardous chemicals.

Recapping injuries can be very serious. However, if a needle must be recapped due to the nature of the work, the use of a mechanical device or the one-handed scoop method must be used (show below):

- Place the needle cap on a flat surface.
- Hold the syringe with one hand. Keep the other hand clear of the work area.
- Carefully lower the needle tip toward and into the needle cap.
- When the needle is mostly in the cap, scoop upward to lift the needle cap onto the needle.
- Once the needle cap is on the needle, use your second hand to secure the cap to the needle or tap it on the ledge of the benchtop.





Decontamination/Cleaning of Cannulas and Reusable Needles:

- Generally, methanol, acid water, deionized (DI) water, or acetone work well for cannula and needle cleaning. The first wash should be with a solution compatible with the chemical that was used (e.g. organic materials should be rinsed with acetone or methanol before water, while an inorganic solution should be washed with water/dilute acid before acetone)
- Dilute acid such as hydrochloric acid will help to dissolve blockage of inorganic salts and catalyst particles. Strong acids such as nitric acid, sulfuric acid and trifluoroacetic acid or acid chlorides as they will damage SS cannulas and reusable needles. Do not use a reusable needle for bromine or strong HBr solutions as these will also damage the needles.
- When a cannula is used for chemical transfers, draw the cannula out of the reagent layer, ensure that enough nitrogen is purged through it to ensure that no significant residue is left on either side of the cannula to avoid clogging.
- Generally, cannulas are cleaned using a vacuum or nitrogen pressure. Cannulas used for the transfer of homogeneous materials can simply be washed with acetone, then water, and finally with acetone before drying in an oven. A contaminated cannula can ruin a reaction and rust can cause a cannula to become clogged, leading to a potential pressure build-up and unwanted events.
- When unable to remove the residue from the needle or cannula, try sonication to help loosen the solid particles.
- Needles used for the transfer of anhydrous solvents do not need to be cleaned and only require drying in an oven before reuse.
- Cleaning can be achieved by connecting the needle to a syringe and then filling the syringe with appropriate solvent to rinse the needle multiple times.
- Needles used to transfer pyrophoric reagents should **first** be rinsed with an inert solvent (e.g. THF {Tetrahydrofuran}) **before** attempting to rinse with water or acetone.
- Needles/cannulas should be washed immediately after use to prevent any solids from building up in the needle causing blockages.
- In case the needle is blocked with solid residue, do not push the plunger hard; instead, submerge the needle in an appropriate solvent to clear the solid particles. Sometimes sonication of needles can work by breaking or loosening the particles inside the needles.

Cannula and Needle Drying Procedure:

- All needles and cannulas should be dried in a secure container in an oven before each use.
- Do not leave loose needles lying in an oven uncapped as they pose a safety hazard to all who use the oven.



Storage and Disposal:

- Only capped needles and protected cannulas should be stored inside a drawer, fumehood or oven.
- Styrofoam can be used to temporarily hold your reusable needles in the fumehood when in use.
- Using a sturdy plastic or a stainless-steel container/box works well to store reusable needles and cannulas in.
- Blocked/damaged reusable needles/cannulas should always be disposed of in a sharps container with the needle tips pointing to the bottom of the container.