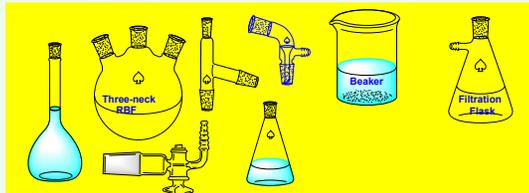


INTRODUCTION

Glassware plays a critical role in chemistry laboratory work. Glass is transparent and does not react with most laboratory chemicals (except hydrofluoric acid and strong bases). Glass is relatively malleable, allowing for the creation of new shapes for apparatus designs. In addition, glassware is often repairable using proper glassblowing techniques. Glassware is also breakable, which can lead to cuts and lacerations, unwanted chemical spills, and in the case of explosions, dangerous projectiles. [Proper handling of glassware is essential for reducing the risks while working with chemicals.](#)

Fig. 1: Some typical glassware used in chemistry laboratories



Always use glassware free from breaks, cracks, chips, and nicks

- Before working with glassware, always inspect it for defects. If defects are discovered, remove the glassware from service. Small defects can turn into major cracks during use. Glassware that cannot be repaired should be disposed of properly.

Fig. 2: Defected glassware with chips & cracks

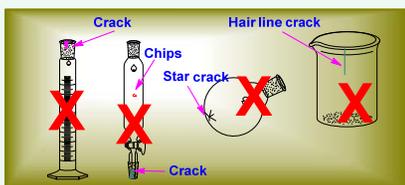
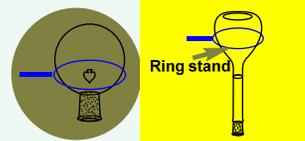


Fig. 3: Ring stand drying



- Use a ring stand or a drying rack for quick glassware drying after rinsing glassware with acetone.

- Do not put hot glassware on cold surfaces or cold glassware on hot surfaces.
- Hot glassware can cause severe burns.
- Hold beakers, bottles and flasks at their sides and bottoms rather than at their tops.

Applying grease to stopcocks and ground glass joints

- Before applying grease, make sure surfaces are dust-free.
- Use a minimal amount of grease. Too much grease on a stopcock or ground glass joint may cause a vacuum leak due to channeling.
- Use hexanes or acetone to remove grease from glassware.

Removal of frozen (stuck) joints and stopcocks

- Apply heat, then tap joint with a small block of wood. Do not heat a closed system containing volatile solvents and chemicals.
- If you are unable to remove the frozen joints, take the set-up to the Glass shop for help.

Glassware under vacuum

- Never apply a vacuum to a creased flask or any apparatus with a flat surface.
- Use a heavy-wall suction flask for filtering product. Never use a Erlenmeyer for this purpose.
- Secure flask with a clamp or other clamping devices.

Glassware under pressure

- Glass has low tensile strength. Pressure puts glass under tensile stress.
- Use rated glass vessels for pressurized reaction. Due to undetectable flaws that may be present in the glassware, it is not advisable to use glass in a pressurized situation.
- Avoid pressurization of a glass vessel for transferring a liquid or a solvent.

Proper clamping of glass apparatus

- Use rubber lined clamp or glass tape at the point of clamp.
- Never overtighten the clamp, overtightening will crack the joint and point of contraction.
- Use multiple and proper clamps for holding the reaction set-up.

Heating and drying of glass vessels

- Flat bottom beakers should only be used for gentle heating.
- Erlenmeyer flasks are good for the moderate heating, such as boiling water. Never heat a heavy-wall filter flask.
- Round bottom flasks are best for heating. Their round shape distributes heat evenly over the surface causing the least amount of stress.
- If possible, avoid using a flame to dry a flask. Oven and drip drying is preferred.

Condenser/glass connector tubing

- Warm plastic tubing with hot water or dip the end of tubing into a solvent such as acetone to soften before pushing it on to the glass connector. Hold the glass connector/adaptor near the end of glass to be inserted.
- Cut plastic and rubber hoses off, don't pull them off.

Flash chromatography

- Use a proper regulator to control the pressure inside the column. Never use uncontrolled pressure for eluting the column.

Fig. 5: Flash chromatography

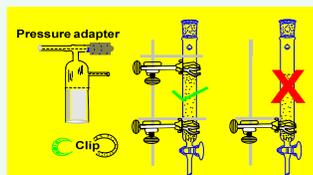
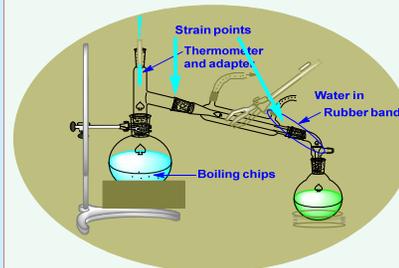


Fig. 6: Distillation set-up



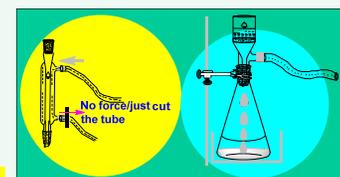
Cleaning, storage, and disposal of glassware

- Handle glassware carefully while cleaning. Use rubber mats in sinks
- Store glassware on non-moveable shelves and cabinets whenever possible.
- If storage in drawers is necessary, use proper padding and secondary containment to minimize the possibility of breakage.
- Use a sturdy cardboard box for the disposal of broken glassware.

REFERENCES

1. A guide to safe handling and design of laboratory glassware: Ethyl Corporation.
2. Techniques and experiments for organic chemistry: R. Fessenden & J. Fessenden.
3. <https://www.nap.edu/catalog/12654/prudent-practices-in-the-laboratory-handling-and-management-of-chemical>

Fig. 4: Connecting Tubing



Distillations

- Use round-bottom flasks only.
- Avoid strains to adapters. Strains on joints can crack the adapters and flasks.
- Use a strong clamp to hold the condenser in place.
- Always leave the apparatus open to the air at the adapter-receiver end when distilling solvent/chemicals at atm. pressure.