

SAFE HANDLING OF LABORATORY GLASSWARE

COURSE OUTLINE

- **Glassware is a marvelous accomplishment. It is:**
 - Designed efficiently.
 - Shaped "by science, for science".
- **But glassware is fragile and can break or shatter under a number of conditions:**
 - If it is bumped.
 - If it is dropped.
 - If too much pressure is applied.
 - If temperatures change too drastically.
- **Any of these problems can cause accidents.**
 - Some accidents are minor.
 - Others can result in serious injuries.
 - Contamination can also be a problem.
- **How do we protect ourselves from glassware accidents?**
 - Learn about our equipment.
 - Inspect it before use.
 - Follow proper procedures.
- **Glassware is everywhere.**
 - Beakers.
 - Flasks.
 - Bottles and jars.
 - Tubing.
 - And more.
- **Each type of glassware is made for a specific purpose.**
 - They should be used only for that purpose.
 - "Makeshift" apparatus is unstable and can lead to accidents.

- **You should always determine the compatibility of glassware with the chemicals you are using.**
 - Especially acids and alkalies.
 - Many chemicals react with glass.
- **Only certain grades of glassware can stand up to lab environments.**
- **Labware can often be heated to extreme temperatures.**
 - Inferior/flawed material can shatter or crack.
- **Certain operations require specifically designed glassware:**
 - Vacuum operations.
 - Gas-producing reactions.
- **Before working with glassware, always inspect it for flaws.**
 - Glass should be pulled from service if defects are present.
 - Discard or send defective glassware to a glass blower for repair.
- **Proper handling of glassware is also important.**
 - Never carry a flask by its neck.
 - Never carry a beaker by its side.
 - Always use two hands carrying any glassware (position one hand under the glass for support).
- **Gloves should be worn whenever glassware is handled.**
 - Cut-resistant gloves are best.
 - Wear lab gloves underneath to keep out liquids.
 - Use insulated gloves with extreme temperatures.
 - Compromises must sometimes be made when a fine sense of touch is required.
- **Never heat or cool glassware unless it is designed for those processes.**
 - Round-bottom flasks are best for boiling liquids.
 - Never set hot glass on a cold bench top.
- **Scratches in glass can grow to cracks later on.**
 - So don't use glass/metal stirring rods.

- **Avoid any physical stresses to glassware.**
 - Where necessary, stabilize it.
 - Use clamps and platforms to relieve pressure.
- **Ground-glass joints are crafted for a perfect fit.**
 - Because of this they sometimes stick.
 - Never force a joint free (the glass can shatter).
 - Lubricate surfaces or use a teflon sleeve.
 - A heat gun can gently loosen the joints.
- **Cutting and bending tubing can also cause problems.**
 - Make sure you are wearing gloves and safety glasses.
- **Several specific steps should be followed to cut tubing:**
 - Position a triangular file where the cut is to be.
 - Score the tube with your a single, light stroke.
 - Grip the tube with your fingers on either side of the score mark (with the score facing away from your body).
 - Gently pull the ends of the tube toward you.
 - The glass should snap at the score mark.
- **Remember to fire-polish the tube's ends.**
 - Removes sharp edges.
 - Keeps cracks from appearing.
- **Bending tubing has its own procedures:**
 - Heat it in a flame until the glass turns red.
 - Pull the ends toward you to form desired angle.
- **Setting up apparatus can involve pushing glass tubes through a cork or stopper.**
 - This should be approached with caution.
 - Determine that holes are the correct size for the tubing.
 - Lubricate the hole and tube (with water or glycerin).
 - Hold the tubing with a towel.
 - Position the tube close to the insertion point.
 - Gently twist the tube into the stopper.

- **Using proper techniques when stirring materials is also important.**
 - Make sure that electrodes, tubing, etc. are placed high enough to avoid the stir bar.
 - Avoid contact with any portion of the apparatus.
- **Some glassware can present unusual safety risks.**
 - Make sure you have had the necessary training before working with specialized equipment.
- **Vacuum operations can severely test glassware.**
 - Container walls must be able to withstand pressure differences.
 - Containers can implode if they are not strong enough.
 - Round-bottomed or thick-walled flasks should always be used.
- **Glassware that is showing repairs should be avoided.**
 - It is more apt to break through thermal shock.
 - Checking for flaws before use is very important.
- **Often, protective measures should also be taken.**
 - Place all vacuum apparatus behind a blast shield.
 - Always wear appropriate protective equipment (goggles, gloves and even a face shield).
 - Cover flasks, dewers and desiccators with tape or mesh, or use PVC coated containers.
- **Using containers made of other materials can also prevent accidents.**

Alternatives include:

 - Metal.
 - Plastic.
 - Teflon.
- **Make sure the containers you select are appropriate for the task.**
- **More glassware accidents occur during clean-up than any other activity.**
 - Keep glassware clear of the sides of sinks.
 - Never use worn out cleaning brushes (they can scratch the glass).
 - Avoid cleaning with "aqua-regia", "chromic acid" or other caustics.

- **Be careful when drying glassware.**
 - Place small articles on towels or in lined baskets.
 - Large containers should be hung on pegs.
- **It is also important to know how to store glassware properly.**
 - Keep it well away from shelf edges.
 - Don't let instruments roll around in drawers (use drawer pads).
 - Place glassware well back in hoods or on benches.
- **Know proper procedures in case of a mishap.**
 - If something is falling, let it drop.
- **Use common sense when doing cleanup.**
 - Wear leather or other cut-resistant gloves.
 - Never pick up fragments with your fingers... use a dustpan and broom instead.
 - Dispose of glass pieces in "glass-only" receptacles.
- **Also be aware of any spilled substances. Look for:**
 - The substance itself.
 - Contaminated broken glassware
- **Spilled materials may have to be disposed of as a hazardous/biological waste.**
 - The situation could conceivably require evacuation.
- **Know the location of eye washes and safety showers.**
 - Make sure you can use them effectively.

*** * * SUMMARY * * ***

- **Remember the major principles for avoiding glassware accidents**
- **Learn about your equipment.**
- **Inspect all glassware before use.**
- **Follow proper procedures.**
- **Use common sense!**