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**Assignment**

 These are the cleaning methods of 4 laboratory glassware:

1. **Initial Glass Cleaning :**

This is the first step in glassware cleaning. If the glassware isn’t clean after these initial steps you can go on to more aggressive cleaning protocols.

**Method;**

* Scrape away any thick solid material from the glass if possible.
* Wipe away any grease from the glass joints with a solvent like acetone which can be used to help remove the grease.
* Put the glassware in a warm cleaning solution of detergent and water.
* Use a brush or cleaning pad to clean any residue or contamination.
* Rinse with tap water first, followed by deionized water and allow to dry.
* Most new glass is slightly alkaline and should be washed upon receipt and generally can be soaked in a 1% HCL or HNO3 solution before wash , rinse in tap followed by DI water and allow to dry.
1. **Using Organic Solvents:**
* Organic solvents are often used to remove contaminants from glass.
* Basically, if it can be readily dissolved in an organic solvent it can be removed by these means.
* The use of organic solvents is complicated due to their flammability and toxicity.
* When working with solvents proper ventilation and appropriate PPE (suitable glove compatibility with the solvent) are necessary.
* Moistening a cloth with solvent is good for easily accessed surfaces.
* Agitating solvent inside of a glass container is another method.
1. **. Aggressive Cleaning Methods:**
* If the mild, aqueous and organic solvent methods described above are not effective then aggressive cleaning method is adopted.
* This method involves releasing the adhered material/contaminant by removing the top layer of silicon oxide of the glass.
* It can also be done by oxiding the material itself from the glass surface.
* This can be achieved by soaking the glass in 2% hydrofluoric acid or a base bath (sodium or potassium hydroxide in either ethanol or isopropanol) before rinsing and cleaning in detergent.
* The aggressive method is achievable due to the borosilicate nature of laboratory glassware as the acid will attach to the silica layer of the glass.
1. **Oxidizing Contaminants from Glassware (Rankem glassware):**
* Often the residue on glass is insoluble to organic solvents, surfactant solutions, or mildly acidic solutions.
* At this point one of the common ways to clean glass is to oxidize the contaminant in order to render it soluble.
* Oxidizing agents include aqua regia (nitric acid and HCl); Chromic acid which is a sulfuric acid based agent; Piranha solution (hydrogen peroxide based agent), fuming sulfuric acid which contains pyro sulfuric acid.