Organic chemistry glassware is often segmented so that pieces can be arranged in a variety of ways to create setups that achieve different goals. It is important that the pieces are securely fastened in an apparatus so that flammable vapors don't escape and pieces don't fall (whereupon the glassware may break or contents may be spilled). Some chemistry labs have a lattice-work of metal bars (Figure 1.3c) secured to the benchtop that can be used for clamping apparatuses, and other labs rely on ring stands (Figure 1.3a). Ring stands should be positioned so that the apparatus is clamped directly over the heavy metal base, not in the opposite direction as the base (Figure 1.3a, not 1.3b).

![Figure 1.3: a) Correct clamping of an apparatus to a ring stands, with the apparatus directly over the metal base, b) Incorrect use of a ring stand, where the apparatus is not directly over the metal base, c) Metal lattice-work for clamping apparatuses.](image)

Metal clamps are used to connect glassware to ring stands or the metal lattice work. Two common type of clamps are "extension clamps" and "three-fingered clamps" (Figure 1.4a). Although in many situations the clamps can be used interchangeably, an extension clamp must be used when clamping to a round bottomed flask (Figure 1.4b), as 3-fingered clamps do not hold well. The extension clamp should securely grasp the neck of a round bottomed flask below the glass protrusion (Figure 1.4b, not Figure 1.4c). Three-fingered clamps are generally used to hold condensers (Figure 1.3b), suction flasks, and chromatography columns (Figure 1.5).

![Figure 1.4: a) Extension and three-fingered clamps, b) Correct use of an extension clamp on a round bottomed flask, c) Incorrect clamping (flask may slip).](image)

Both types of clamps often come with vinyl sleeves that may be removed if desired. The vinyl sleeves provide a gentle grasp for glassware, but should not be used with hot pieces as they may melt (or in the author's experience catch on fire!). Sometimes fire resistant sleeves are also provided with clamps as an alternative (right-most clamp in Figure 1.4a).

![Figure 1.5: Examples where three-fingered clamps are used to hold: a) Flasks, b) Chromatography columns, c) Pipette columns.](image)

Ring clamps (or iron rings) are also commonly used in the organic lab. They are used to hold separatory funnels (Figure...
1.6a), and can be used to secure funnels when filtering or pouring liquids into narrow joints (Figure 1.6b). Furthermore, they can be used along with a wire mesh to serve as a platform for supporting flasks (Figure 1.6c).

![Figure 1.6: Using ring clamps for: a) Holding separatory funnels, b) Holding funnels, c) Assembly of an adjustable platform.](image)

Plastic clips (sometimes called "Keck clips" or "Keck clamps") are also commonly used to secure the connections between joints (Figure 1.7). The clips are directional, and if they don't easily snap on, they are probably upside down. Plastic clips should not be used on any part of an apparatus that will get hot, as they may melt at temperatures above 140 °C (Figure 1.7b). Metal versions of these clips can be used alternatively in hot areas. Clips should not be relied upon to hold any substantial weight, as they can easily fail (especially if they have been warmed). Therefore, reaction flasks should not be held with just clips, but always supported in some more significant way (e.g. with an extension clamp attached to a ring stand).

![Figure 1.7: a) Using a plastic clip, b) Melted clip.](image)

**Contributor**

Lisa Nichols (Butte Community College). *Organic Chemistry Laboratory Techniques* is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. Complete text is available [online].