Extracting and Washing

Nonpolar organic solvents are insoluble in water – when in contact with water, they form a separate layer. This makes it possible to separate things that are soluble in water from things that are soluble in nonpolar solvents. These separations are called extracting and washing.

Extraction and washing are very similar – in fact, they involve the very same physical operations. The difference is that when you extract something, you remove a product from the mixture, leaving the impurities behind. When you wash something, you remove unwanted impurities from a mixture, leaving the product in the original solution.

It is important to keep track of where the desired product is – it could be in the water layer or the organic layer, and it could be on the top or the bottom, depending on the particular reaction you are running. Never throw away any of the layers until you have isolated the product – errors in extractions and washings can be easily remedied as long as you still have everything.

Small scale extractions and washings can be sometimes performed in a conical vial or test tube. However, a useful piece of glassware has been designed to facilitate them. It is called a separatory funnel (often abbreviated sep funnel). This is the most expensive piece of glassware you will use – be careful with it!

Procedure:

- When you want to perform an extraction or washing, set the sep funnel onto the prongs of your clamp, place a beaker or flask underneath it, and make sure the stopcock is closed! (If you don't, your solution will run out. If you have forgotten to place a beaker underneath, you'll lose your reaction!)

- Add the solution to be washed or extracted. Then add the solvent or aqueous solution you will use to wash or extract, adding enough to make a decent-sized layer.

- Put the stopper in the top, turn it upside down (stopcock up), and shake the funnel gently to mix the two fluids well (be sure to keep your hand on the stopper so that it won't come out). Then open the stopcock slowly to release any pressure that has built up because of the shaking (it should still be upside down!). Close the stopcock and shake gently again. Release the pressure.

- Turn the sep funnel right side up and set it back on the clamp. Allow the liquids to separate. If there is a middle layer that won’t separate, this is called an emulsion. You may need to add some saturated aqueous sodium chloride, which will increase the polarity of the water layer and encourage separation.

- When the layers have separated, remove the stopper, open the stopcock, and drain out the bottom layer. Go slowly when you near the end, and stop just before the top layer begins to come out. Notice that you can only remove the bottom layer – if it is the top layer you want to remove, you have to first drain the bottom layer, then the top layer in a separate container, than put the bottom layer back in.

- You have now finished one extraction or washing. You may need to repeat, as per the instructions.