One of the reagents that is commonly used for oxidation in organic chemistry is chromic acid. This reagent is straightforward to use once deciphered. However, there are a vast number of different ways that textbooks (and instructors) show it being used in reactions.

Chromic acid, $\text{H}_2\text{CrO}_4$, is a strong acid and is a reagent for oxidizing alcohols to ketones and carboxylic acids. For reasons primarily concerning safety and convenience, chromic acid tends to be produced in a reaction vessel as needed (through the addition of acid to a source of chromium), rather than being dispensed from a bottle.

This is where the trouble begins. Choosing a source of chromium to produce $\text{H}_2\text{CrO}_4$ is a lot like choosing a favorite brand of bottled water. Beyond the packaging, they’re pretty much all the same. Depending on which textbook or instructor you have, however, you might see several different ways to do this, and it can be very confusing.

The key point is that $\text{Na}_2\text{CrO}_4$ (sodium chromate), $\text{Na}_2\text{Cr}_2\text{O}_7$ (sodium dichromate), $\text{KCrO}_4$ (potassium chromate), $\text{K}_2\text{Cr}_2\text{O}_7$ (potassium dichromate), and $\text{CrO}_3$ (chromium trioxide) are alike in one crucial manner: when they are combined with aqueous acid, each of them forms $\text{H}_2\text{CrO}_4$, and ultimately it is $\text{H}_2\text{CrO}_4$ that is involved in the important chemistry. Unfortunately I rarely see this point explained in textbooks. I remember this causing some confusion for me when I took the course. The K or Na ions present are just spectators.

Once $\text{H}_2\text{CrO}_4$ is formed, its reactions are pretty straightforward: it converts primary alcohols (and aldehydes) to carboxylic acids and secondary alcohols to ketones.
Once deciphered, chromic acid is a fairly straightforward reagent. It oxidizes primary alcohols to carboxylic acids and secondary alcohols to ketones. It will also oxidize aldehydes to carboxylic acids.

It does this through the addition of the alcohol oxygen to chromium, which makes it a good leaving group; a base (water being the most likely culprit) can then remove a proton from the carbon, forming a new $\pi$ bond and breaking the O-Cr bond.

Due to its high toxicity, chromic acid tends to find very little use in the organic chemistry laboratory outside of undergrad labs, and there are far more useful reagents available for performing these transformations.
Contributors

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