**Discussion and Results**

The main purpose for this lab was to use techniques of fractional distillation to separate methyl acetate, C3H6O2, and propyl acetate, C5H10O2. The original sample included 1:1 (methyl acetate: propyl acetate), 50:50 separations cannot be achieved due to the pressure in Boulder (where this experiment was conducted, 629mmHg), and for a perfect separation to exist it has to be done at sea level 760mmHg. Both distillations are effective, however, the difference between the two comes in when the 2 compounds that needs separation, have a boiling point closer together. That is when; fractional distillation follows the ideal distillation closely. Thus, in this lab experiment, the fractional distillation proved to be a better method than that of simple distillation.

Even though the fractional distillation consisted a better separation, it was slower in comparison to the simple distillation.

During the Gas Chromatography, the first one of Simple Distillation had 96.91:3.09 (methyl acetate: propyl acetate) with the RT as 0.795 and 1.380 respectively. For the second one, it was 52.23:47.77 (methyl acetate: propyl acetate) with the Retention time being 0.790 and 1.390 respectively. While for the first one of Fractional distillation it was 100:0 (methyl acetate: propyl acetate) with the retention time of 0.870 and 0 respectively. For the second one it was 91.87:8.13 (methyl acetate: propyl acetate) with the Retention time of 0.885 and 1.465 respectively. This actually should’ve been more even; this is a result of heating up very quickly allowing the propyl acetate to evaporate along with the methyl acetate during the fractional distillation. This could also lead to the conclusion that there were impurities in the substances. Even though fractional distillation should’ve given a better separation, in this particular case, the simple gave a better separation than the fractional.   
A final limitation could be the amount of drops lost in between switching the flask with the sample vial to collect the drops. A better way to have done this or to improve in the future is to hold the sample vial ready before having to take the flask out after the 3mL line, and then quickly places the sample vial-allowing minimum to zero loss of substance.