Introduction:

The technique of chromatography goes back to the beginning of the 20th century. It has evolved into many different applications or forms. Some of the techniques involve instrumentation and some do not. In today’s experiment we will learn to use one of the instrumental techniques, called gas chromatography. All chromatographic techniques are used to separate and identify the components of a mixture. All make use of the different solubilities of each component in two parts of the chromatograph (today’s instrument is called a gas chromatograph, while the technique is referred to as gas chromatography or GC for short). All chromatographic applications have 2 key parts, a moving fluid (usually a liquid but in our case a gas) called the mobile phase and a non-moving solid or sometimes liquid, called the stationary phase. The sample is placed into the stream of the mobile phase which carries it to the stationary phase (frequently called the column). Depending on the properties of each component, each will have different attractions to the mobile and stationary phases. Eventually all components will be flushed through the stationary phase by the mobile phase, but will come through at different times, and can therefore be identified by how long it takes for them to each pass through. This time is called the retention time. Each component in a mixture should have a different retention time and if you compare these retention times to those of known compounds, you may be able to identify the components of a mixture. We will attempt to do this in today’s experiment.

Procedure:

1) All GC’s have some parts in common. There is always a place for placing the sample in the stream of the mobile phase. This is called the injection port. In our GC’s all injections are done manually, using a syringe. Your instructor will demonstrate how to do this safely and properly. All GC’s have controls for temperature of the stationary phase (usually elevated well above room temperature), for detection of any component coming through the column (called a detector), which produces an electrical signal which is amplified by a device called an attenuator. This signal is sent to some sort of recording device, perhaps an electrical chart recorder with a pen which produces a graph of your sample elution pattern, or perhaps a computer. Our GC’s all use an electrical recorder. The settings for all of these devices will be pre-set by your instructor for optimal results for today’s experiment. **Do not change these settings unless told to do so by your instructor.**
2) Inject 1 microliter of each known standard that might be in your commercial sample. These will be provided by your instructor. They will include acetone, some different alcohols and perhaps one or two other compounds. Follow all instructions as to the proper technique for injecting the sample. Always clean your syringe thoroughly between each sample. Wait until you get a complete peak on your graph for the sample before injecting a different sample. If you get no peak or a very small peak or a peak that goes off the paper, call your instructor who will make suggestions as to how to improve your results.

3) Inject 2 microliters of your commercial sample. Wait 2 minutes longer than the longest time for any of the standards.

Data and Report:

1. Measure the distance from the top of the air peak to the top of the peak representing each standard known substance. This is called retention distance. Record this in the table at the end of this experiment. The retention time is the same (because the chart speed will be one unit per minute), except the units will be minutes rather than cm or inches. A unit will be a cm or an inch depending on your recorder. Your instructor will tell each of you what to use. Record the retention times for each standard in the table at the end of the experiment.

2. Measure the distance from the top of the air peak to the top of each peak in the chromatogram of your commercial sample. **NOTE:** Each peak will have its own value so you may have several values for this sample. Record all of these values in the table at the end of the experiment. As above, record the retention times for each peak in this sample in the table.

3. You may assume that any retention time in your commercial sample that matches a retention time of one of the standards has the identity of that standard. Allow for experimental error so that retention times that are within about 10% can be assumed to be identical.

4. From this information, identify the components of your commercial sample. There may be some components in your sample that you cannot identify. That is fine. Only name those that you can identify.
<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>RETENTION DISTANCE</th>
<th>RETENTION TIME</th>
<th>IDENTITY</th>
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</thead>
<tbody>
<tr>
<td>Unknown Commercial Sample</td>
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