Friday Worksheet   **Name: ………………..**
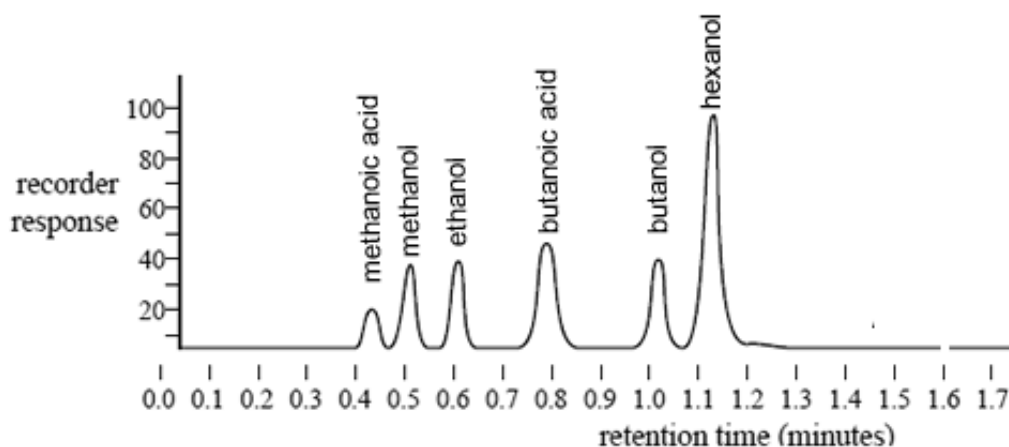
Chromatography 2

1) A forensic chemist wants to test the accuracy of a gas chromatograph that is to be used for the analysis of alcohol content in a sample of contaminated river water.. A water sample may contain a number of volatile chemicals that can interfere with the identification and measurement of ethanol in the blood. A sample containing a mixture of ethanol and several other volatile chemicals was injected into the gas chromatograph. The following chromatogram was obtained.

The forensic chemist claims that the presence of these volatile chemicals would not affect the qualitative analysis of ethanol.
i. What evidence is presented in the chromatogram to support this claim?
Ethanol has a unique retention time peak at 0.6 minutes

ii. To determine the percentage of alcohol in a water sample only the peak at a retention time of 0.6 minutes is measured. Explain why.
This represents the amount of ethanol in the sample.

iii. A student was told that beads coated with methyl groups were packed into the column. Is the student wrong or right. Explain.
The student is likely to be right. The more polar molecules have a longer retention time. That means they interact more with the stationary phase than the mobile phase.
Molecules with longer retention times have larger non-polar sections than the molecules with a shorter retention time.
iv. What is the significance of the size of each peak?
The area under the peak represent the amount or concentration of substance present

vii. What is the significance of the retention time of each peak?
The retention time can be used to identify the molecule.

2) The following calibration graph was constructed using simulated standard water alcohol samples ranging in concentration from 0.000% to 0.400% m/v ethanol. Each standard was run through the chromatography column and the area under the peak produced at a retention time of 0.6 minutes was measured
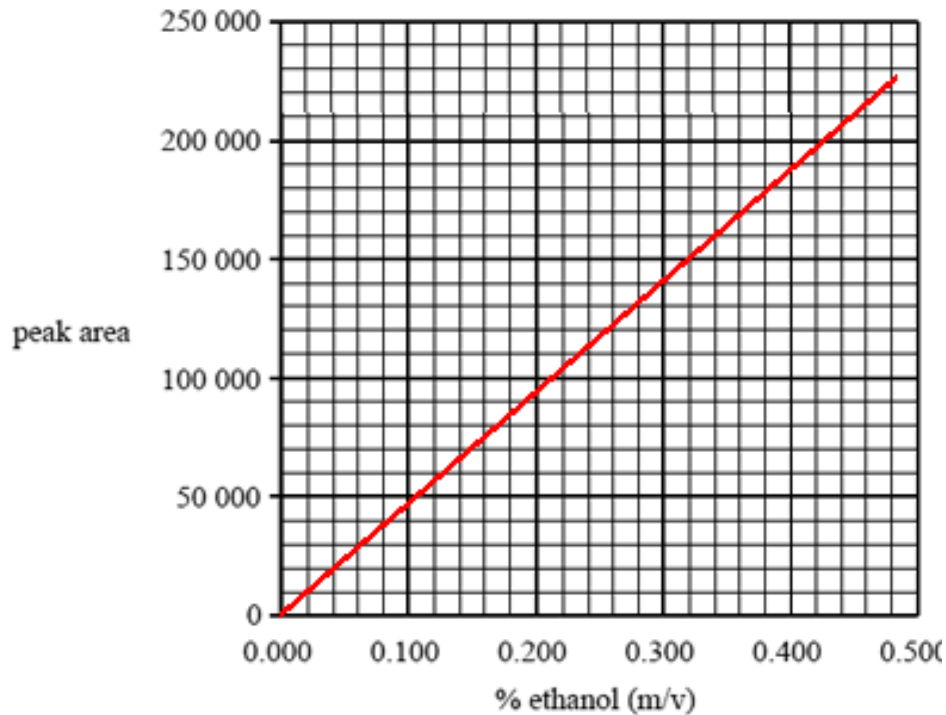
i.   The ethanol content of a sample of Yarra river water was determined using this chromatographic technique.
Determine the percentage (m/v) of alcohol in the water if the peak area at a retention time of 0.6 minutes was found to be 150 000

0.320 %(m/v)

ii.   What is the concentration in mol L⁻ of the water sample?
0.320 g / 100mL
Step 1 find mol of ethanol
=> 0.320 / 46.1 = 0.00694
Step 2 find the concentration in mol/L
=> 0.00694 / 0.100 = 0.0694 M