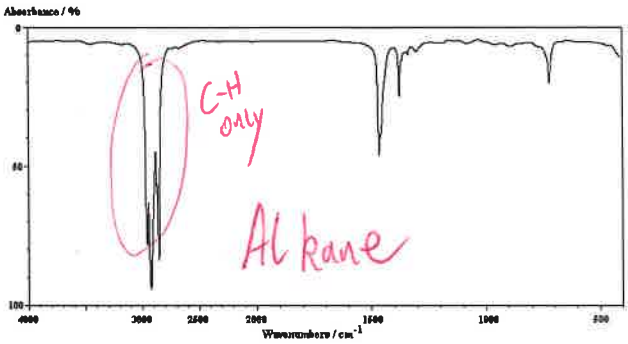
Quiz 11.3 – Vibrational Spectroscopy

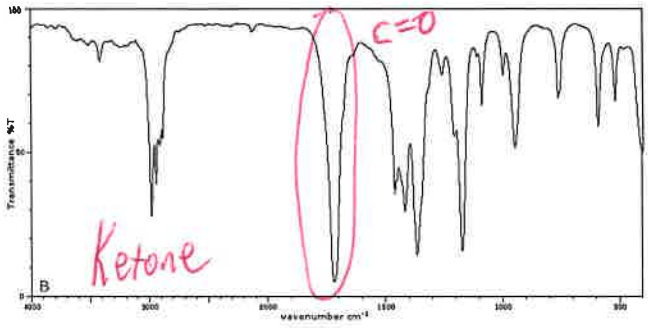
Name: Key

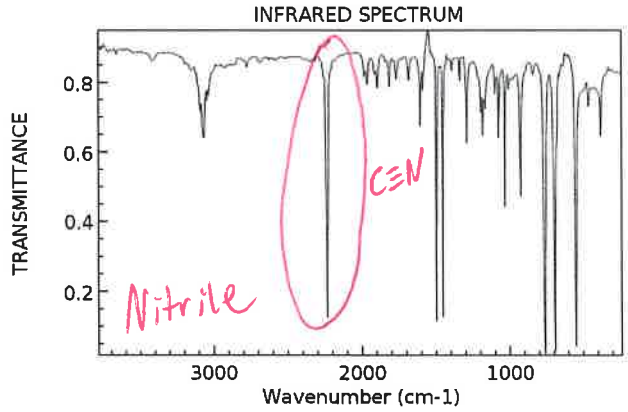
Functional Groups

These are infrared spectra for (in no particular order) a ○ Nitrile, ○ Alkane, ○ Alcohol, and ○ Ketone

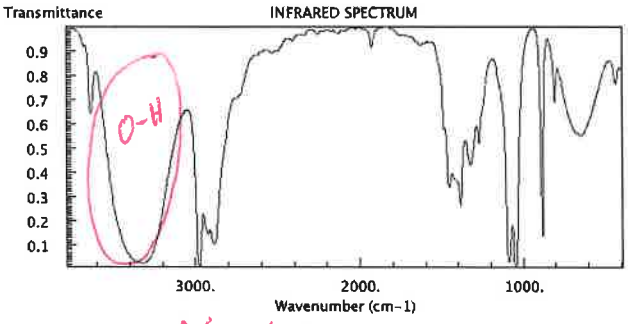
Label each spectra according to the correct functional group, and circle the feature or features on each infrared spectrum which you used to identify it







NIST Chemistry WebBook (https://webbook.nist.gov/chemistry)

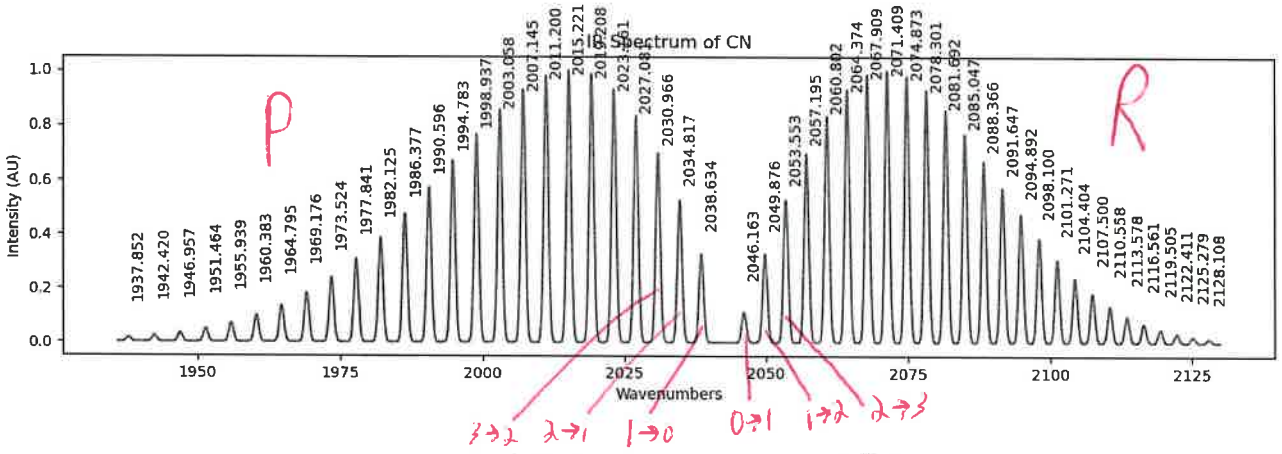


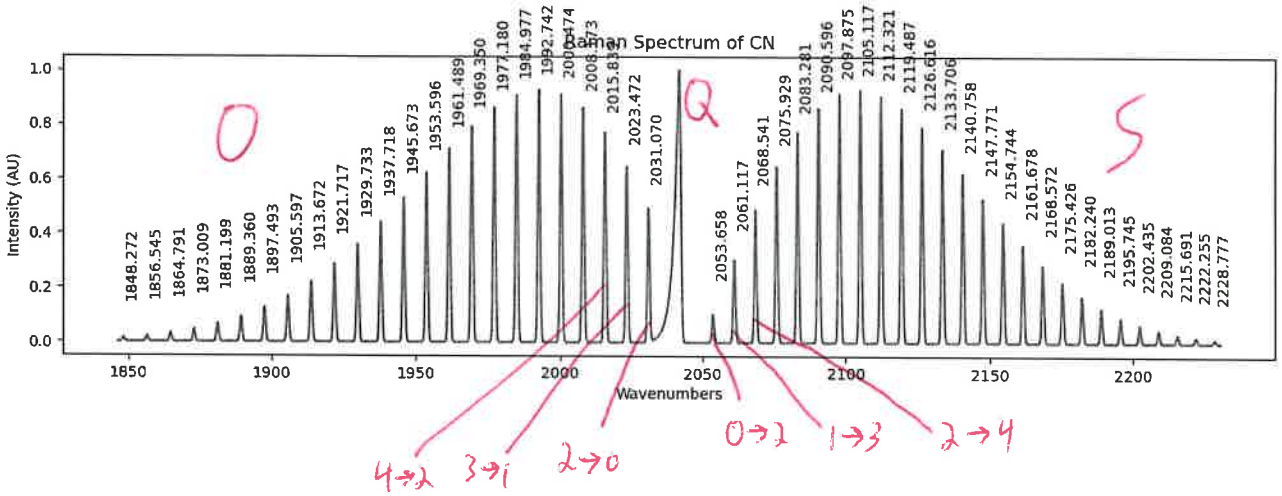
Alcohol

Ro-Vibrational Spectra

Below are IR and Raman spectra of the CN radical. Annotate them by labeling the following:

1. O, P, Q, R, and S branches
2. Initial and final states for the first 3 transitions in each branch
3. α_e 0.0174 cm^{-1}
4. $\tilde{B}_e$, $\tilde{B}_0$, and $\tilde{B}_1$ 1.8997 cm^{-1}, 1.891 cm^{-1}, 1.874 cm^{-1}





See Spreadsheet

Vibrational Anharmonicity and Birge-Sponer Plots

Below is a table of the first few vibrational transitions for the CN radical

States	Energy (cm^{-1})
$1 \leftarrow 0$	2042.416
$2 \leftarrow 1$	2016.242
$3 \leftarrow 2$	1990.068
$4 \leftarrow 3$	1963.894
$5 \leftarrow 4$	1937.720

Draw or print a Birge-Sponer plot and give the following quantities:

1. $\tilde{\nu}$ 2068.59 cm^{-1}
2. $\chi_e\tilde{\nu}$ 13.087 cm^{-1}
3. $\tilde{D}_e$ 81,746 cm^{-1}
4. $\tilde{D}_0$ 80,712 cm^{-1}

See Spreadsheet