Solutions to prob set 1; chem 6a/al

Examine the following infrared spectrum. Then, respond to the following statements, indicating that they are either true (mark with a "T") or false (mark with an "F"). If true, then draw an arrow to the absorption in the spectrum that corresponds to the indicated vibration. If false, then indicate where you would have expected to have seen the absorption (use the wavenumber scale). NOTE: A correlation chart can be found on the next page.

[a] There is a carbon-carbon triple bond stretch.
   True

[b] There is a C-H stretch where the H is appended to an sp-hybridized carbon.
   False; anticipated ~3300 (cm⁻¹).

[c] There is a carbonyl stretch.
   True

[d] There is an OH stretch.
   False; anticipated ~3500 (cm⁻¹).

[e] One sees a C-H stretch, one where the H is attached to an sp³-hybridized carbon.
   True
In the following selections, I indicate what one would see - you determine the absorption frequency by looking at the table(s) in your text.

\[
\begin{align*}
&\text{CC triple bond stretch, C-H stretch where the carbon is sp hybridized as well as the stretch due to C-H where C is sp}^3. \\
&\text{~2200 cm}^{-1} \quad \text{~3300 cm}^{-1} \\
&\text{~2950 cm}^{-1}
\end{align*}
\]

\[
\begin{align*}
&\text{Would show characteristic absorption for an aldehyde carbonyl stretch.} \\
&\text{~1725 cm}^{-1}
\end{align*}
\]

\[
\begin{align*}
&\text{A characteristic ketone carbonyl absorption.} \\
&\text{~1715 cm}^{-1}
\end{align*}
\]

\[
\begin{align*}
&\text{Both C-H of sp}^2 \text{ and sp}^3 \text{ carbon as well as CC double bond stretch} \\
&\text{~3050 cm}^{-1} \quad \text{~2950 cm}^{-1} \quad \text{~1650 cm}^{-1}
\end{align*}
\]

\[
\begin{align*}
&\text{...strong O-H absorption = most diagnostic} \\
&\text{...broad when hydrogen bonded, but sharp when not} \\
&\text{Will probably see each - is concentration dependent.} \\
&\text{~3500 cm}^{-1}
\end{align*}
\]

**Note:**
The mass spectrum for each material would also be of use, as each compound has a different molecular weight. Consequently, one would expect to see molecular ions whose mass to charge ratio would correspond to the molecular weight of each molecule.