Calculate the rotational absorption spectra of the ^{13}CO molecule

1. Determine the ^{13}CO moment of inertia
   a. Find the ^{13}CO bond length (assume it is the same length as the CO bond)
   b. Calculate the center of mass of the ^{13}CO molecule
   c. Calculate the moment of inertia of the ^{13}CO molecule

2. Use the simple dumbbell rotational spectrum model to determine the first 26 rotational energy levels of ^{13}CO

3. Use these to determine the 25 lowest rotational line spectra in both Hz and cm^{-1}.

Based on the JPL molecular spectroscopy catalog (spec.jpl.nasa.gov), calculate how close these frequencies are to the actual rotational line frequencies in a fractional sense: $(f_{model}-f_{actual})/f_{actual}$.