1. An ether produced in large volume these days is methyl tert-butyl ether (MTBE). MTBE is added to gasoline both to reduce the emission of carbon monoxide (CO) in automotive exhaust gas and to replace tetraethyllead as an antiknock agent. Answer all of the following questions about MTBE:
   (a) Draw a bond-line formula for the structure of MTBE (show below). (10 pts)
   (b) What is the geometry of MTBE with respect to the central oxygen? (10 pts)
   (c) What is the shape of MTBE with respect to the central oxygen? (10 pts)
   (d) What is the hybridization state of the central oxygen in MTBE? (10 pts)
   (e) Does MTBE have a net dipole moment? If so, indicate this in your structure below. (10 pts)

2. Circle and label all of the functional groups in the hypothetical molecule shown below. Be sure to indicate degree of substitution (1°, 2°, 3°) where applicable. Is this molecule a cis or trans alkene? (50 pts)

**Bonus (+2 pts): The compound you’re synthesizing in lab this week has which functional group?**