**Quiz DMTA**

1. Make a sketch of the general design of a dynamic mechanical thermal analysis instrument (DMTA).
2. How does a DMTA compare with a dynamic dielectric spectrometer?
3. How are the loss and storage modulus and tan δ determined using the DMTA?
4. What is a Cole-Cole Plot? How should this plot look for a material with a single relaxation time?
5. Sketch the storage, loss modulus and tan δ for a semi-crystalline polymer across temperatures covering the glass, glass transition temperature, rubbery plateau, and melting point.
6. What is the WLF equation? How does it differ from a simple Arrhenius behavior and from Vogel-Fulcher behavior?
7. How can the WLF equation be used to shift DMTA data from different temperatures to a master curve as a function of frequency?
8. Explain why and for what samples you might want to use the following types of deformation in a DMTA: Tensile, Compressive, Shear, 3 Point Bend, Torsion.
9. What is the expected effect of adding a filler on time-temperature superposition? (For example in a tire.)
10. What is the plateau modulus and how can it be used to calculate the entanglement molecular weight?
11. What information can be obtained from a Cole-Cole plot from DMA data other than if the materials displays a single relaxation time.