1. From a material structure point of view,
   (a) How to differentiate between metals and ceramics?
   (b) How to differentiate between ceramics and glasses?

2. What is the mechanism through which Barium Titanium oxide BaTiO₃ exhibits ferroelectric response?

3. The shown specimen is made of a ferroelectrics ceramic crystal. First it is exposed to electric field. Then it is subjected to an external force, first in the y direction followed by the x direction (see figure below). If the two forces are equal, would the resulting displacement in x and y-dn be equal or not? Explain your answer?

4. Suppose you are given a cylinder of copper single crystal with the cylinder axis aligned in the [100] dn., then you applied a compressive load along the axis in two steps, the first is very small load that the crystal deform elastically, the second is a high load level that the crystal will deform plastically (will slip). What is the expected deformation pattern? Explain your answer with a sketch.

5. What is the interplanar spacing and planar density for the (111) plane in a chromium single crystal? What are the corresponding the line densities of the directions: [100], [101] and [111]?