1. Glass vs. crystal

a) In the context of amorphous inorganic compounds, name two network formers, two network modifiers, and one intermediate.
b) Sketch the variation of molar volume with temperature for pure silica. Show glass formation at two different cooling rates. Show a crystallization process on the same plot. On each cooling curve, label the melting point or the glass transition temperature.
c) What are two key factors that determine whether a material will solidify as a glass or a crystal?

2. What makes a glass?

Why does Al not form a stable glass, though elemental Se does?

3. Experimental processes to determine crystallinity

Describe two analytical techniques that allow you to distinguish an amorphous solid from a crystalline solid.

4. Network modifiers and $T_g$

a) Draw the network structure of a borate glass.
b) Explain how the addition of Na$_2$O to B$_2$O$_3$ decreases viscosity of the glass melt.
c) To raise the glass transition temperature of the borate glass, do you increase or decrease the cooling rate? Explain.