



Do yourself a solid.

The following problems sets are compiled from B. A. Averill and P. Eldredge, *General Chemistry: Principles, Patterns, and Applications*. License: CC BY-NC-SA. Source: [Open Textbook Library](#).

1. Glass vs. crystal

- In the context of amorphous inorganic compounds, name two network formers, two network modifiers, and one intermediate.
- 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.
- 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

- Draw the network structure of a borate glass.
- Explain how the addition of Na_2O to B_2O_3 decreases viscosity of the glass melt.
- To raise the glass transition temperature of the borate glass, do you increase or decrease the cooling rate? Explain.

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