# MATRL 218/CHEM277: Assignment 1

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Due date: January 25th 2017 (in class, or under my door). Keep everything brief.

1. Are all amorphous solids considered glasses. How are glasses characterized?

2. Many liquids can be rapidly quenched to give a glass. Why can't this be indicated in a phase diagram? It has been observed that certain features in phase diagrams are found associated some glass forming alloys. What are these features, and briefly why do they aid glass formation? Hint: PbO-V_2O_5 phase diagram:
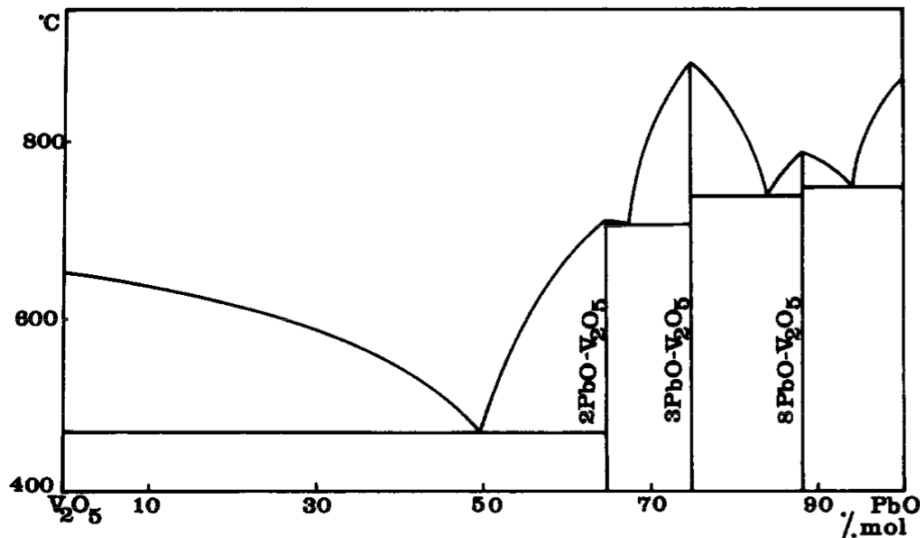
3. Why does the entropy of a liquid decrease when it becomes a glass, even though the effective structures of liquids and glasses ("snapshots") are similar, suggesting similar configirational entropies?

4. Explain structural frustration in the context of forming crystalline versus glassy structures – pentagons are frustrated from forming crystalline packings in flat 2D (frustration), but not on curved surfaces, like around a sphere. Try and explain with a sketch. DOes the titling of pentagons on the surface of a sphere have implications for the structure of matter?

5. Look at this talk by Davis Norris: http://nanoparticles.org/pdf/12-Norris.pdf and explain why when olloidal spheres are close-packed, *fcc* packings may be preferred over *hcp*.