Exercise 3.3-1

Quick Questions to

3. Point Defects and Diffusion

Here are some quick questions:

- The *answers* are sometimes (and possibly only indirectly) contained in the links.

3.1.1 Diffusion and Point Defects

- Give examples of products / processes / technologies that depend in a major way on point defect diffusion.
- Write down and discuss Fick's 1st law
- Write down and discuss Fick's 2nd law
- How do Ficks Laws connect to atomic diffusion? Give the two important equations dermining the diffusion coefficient D i) by atomic jumping, and ii) via the diffusion length L.
- What is the geometry factor g concerning jumping point defects in lattices? Can you give numbers for some common lattices?

3.2 Diffusion mechanisms

- Describe at least **2** possibilites for the diffusion of a substitutional and interstial impurity atom, respectively.
- Which diffusion mechanisms are the most important ones?
- For a substitutional impurity atom that diffuses via a vacancy mechanism, the diffusion coefficient D will be proprotional to ....?
- How do atoms diffuse in amorphous materials - e.g. glasses and polymers?
- What is self diffusion? The self-diffusion coefficient D_{self} is given by....?
- Any given atom in a given crystal will sooner or later leave its original place because of self diffusion. How long - roughly - does it take at high temperatures for all atoms to have changed positions? How about the atoms in your brain?