Homework 2: Silicon & Project

Question 1 (project)
In no more than 500 words and a maximum of 2 figures, describe the Flow cytometer on chip. Please cite any references you used from literature.

Question 2 (Silicon Fabrication)
Please mention the sequential process steps of the wafer fabrication.

1) 
2) 
3) 
4) 
5) 
6) 
7) 
8) 
9) 
10) 

Question 3 (Silicon Defects)
Please mention all the crystal defects (a-h) depicted in the figure below.

[Diagram of crystal defects]

a) 
b) 
c) 
d) 
e) 
f) 
g) 
h) 

Question 4 (substrate materials)
A mixture of 40% of silicon and 60% germanium (by weight) is heated to 1150 ºC. If the material is in thermal equilibrium, what is the concentration of silicon in the melt? At what temperature will the entire charge melt? The sample temperature is raised to 1400 ºC, then slowly cooled back down to 1150 ºC. What is the concentration of silicon in the solid phase?
Question 5 (substrate materials)
A silicon wafer 500 µm thick having a diameter of 4 in. contains 5.41 mg of boron uniformly distributed in the substitutional sites. Find (i) the boron concentration in atoms/cm³ and (ii) the average distance between the boron atoms.

Question 6 (process flow)
Design and briefly describe a process flow (with figures) for fabricating the following dual-channel structure. How many lithography steps and etch steps are used in the fabrication process?