SLT 5 : Dry etching

5.1	What is plasma? What other techniques use plasma? How is it generated in DE? Give a schematic of the common DE equipment.
5.2	Assume you are asked to etch Si. Discuss the effect of plasma parameters in a silicon based dry etching equipment on the etch results, e.g. etch rate, isotropy/anisotropy. Consider parameters such as gas composition, C/F ratio, bias voltage.
5.3	Deep reactive ion etching (DRIE) is an important fabrication step for silicon etching. Why is that? Describe the so-called Bosch process in more detail.
5.4	For dry etching of (1) SiO_2, (2) Al, and (3) Polyimide (PI), list one commonly used etchant gas chemistry and one suitable masking material for each material, and briefly state why this combination provides good etch selectivity.
5.5	Apart from plasma based dry etching techniques, there are some alternatives such as XeF2 gas etching and HF vapor phase etching. Explain the etching mechanisms of each method, and compare them to the dry etching methods that rely on carbon halogen radicals (e.g. CFx species). Discuss the differences in etch chemistry, selectivity, anisotropy, and typical applications.
5.6	You are given a Si wafer with 1.5 µm thermally grown SiO_2. Using only photolithography and dry etching, design a process flow to fabricate a suspended SiO_2 cantilever. Describe each processing step with a drawing and explain the dry-etching procedure required to release the cantilever.