1. 1 pt. for effort on the whole problem
For each part, 1 pt. for correct final cross-sections (6 pts. total)
2. 0.5 pts. for each correct entry (10 pts. total)

<table>
<thead>
<tr>
<th>Substrate Potential</th>
<th>Sputter Dep</th>
<th>Sputter Etch</th>
<th>Plasma Etch</th>
<th>RIE</th>
<th>DRIE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grounded</td>
<td>Argon (Inert Gas)</td>
<td>Argon (Inert Gas)</td>
<td>Grounded</td>
<td>Floating</td>
<td>Low power RF bias</td>
</tr>
<tr>
<td>Gases</td>
<td>Argon (Inert Gas)</td>
<td>Inert Gases + Halogens</td>
<td>Inert Gases + Halogens</td>
<td>Etch: SF6 Passivation dep: C4F8</td>
<td></td>
</tr>
<tr>
<td>Surface process</td>
<td>Kinetic</td>
<td>Kinetic</td>
<td>Chemical</td>
<td>Chemical, some kinetic</td>
<td>Chemical, some kinetic</td>
</tr>
<tr>
<td>Dep/Etch Type</td>
<td>Directional, from a wide source</td>
<td>Anisotropic, non-selective (Like sandblasting)</td>
<td>Isotropic, selective</td>
<td>Usually anisotropic, selective</td>
<td>isotropic silicon etch, anisotropic Teflon etch, selective; isotropic deposition</td>
</tr>
</tbody>
</table>

3. 1 pt. for each part (4 pts. total)
   a. No
   b. The etch is chemical. You can tell from the scalloped sidewalls.
   c. Very selective. Oxide selectivity nominally 100:1
   d. Conformal deposition of a passivation layer by the C4F8 gas cycle protects sidewalls from getting etched

4. 1 pt.
   It goes boom!

5. 7 pts. total
   a. 1 pt. for each part (2 pts. total)
      i. 33 targets
         ii. The cryo pump takes over at 0.5 Torr. The system goes down to the mid 10⁻⁷ Torr range before beginning the process
   b. 1 pt. each for talking about oxide and silicon etch (2 pts. total)
      The selectivity to oxide is about 0.5. 20% overetch of 1000Å of nitride will etch about 100Å of oxide. Silicon can be etched about 16x faster than nitride so we will etch 3200Å of silicon
   c. 1 pt. for each part (3 pts. total)
      i. For the narrower 2µm feature (They appear to have 5µm of space between them), the etch rate is 0.64µm/cycle. Each cycle for DEEP SILICON 1 is 17s so the etch rate is about 0.04µm/s. For the 20µm feature, we measure about 80µm of total etch, giving an etch rate of 0.8µm/cycle -> ~0.05µm/s. Note that in the clean room it is usually more convenient to think of etch rates in terms of µm/cycle, since this is how most etchers operate.
ii. It is more difficult for gases to diffuse into and out of narrower features than larger features. This slows the etch rate down.

iii. The etch ran for 65 cycles (see page 6). The 20µm feature gives about 0.55µm/cycle and the 4µm feature gives 0.4µm/cycle. Different mask, different, etcher, different facility, but qualitatively similar performance.

6. 1 pt. for taking a look and listing something
   I spy with my little eye a PR spinner, an evaporator, and some furnaces