NAME: KEY

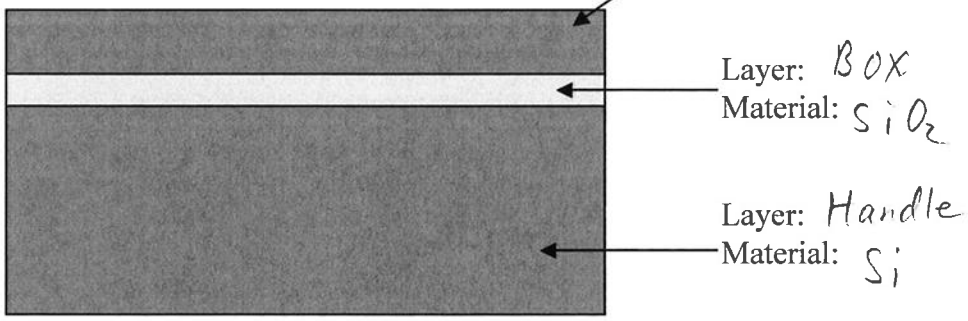
Exam #1 **ELEC 5820/6820** **Wed 9/30/15**

Problems:

1) Circle the chemical that is ***NOT*** an anisotropic wet etchant of silicon **(5 points)**:

EDP, HF, KOH, TMAH

2) A cross-sectional drawing of an SOI wafer is presented below. (a) Label the layers and the materials **(10 points)**:



(b) What does "SOI" stand for **(5 points)**?

Silicon On Insulator

3) What is the definition of a plasma **(5 points)**?

A quasi-neutral gas of neutral and charged particles characterized by a collective behavior

Match the question with an answer by writing the letter of the answer in the blank next to the question. No answer is used more than once. (20 points)

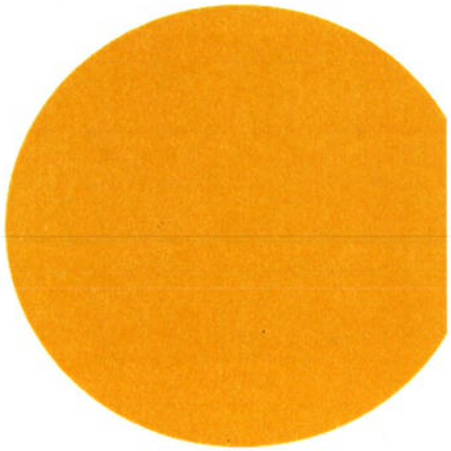
Questions

1) Describes a process that affects equally in all directions : G
2) The phenomenon where two microstructure come into permanent contact: K
3) A method for making a single crystal Si boule: M
4) The process of transferring a pattern from a glass mask to a photoresist layer: B
5) A front face plane: D
6) The family of front face planes: H
7) The vector direction normal to a front face plane: I
8) An undesirable pyramid structure that can appear on a front face plane: F
9) An oxygen plasma process for removing organic materials from a substrate: J
10) A measure of the anisotrophy of an etch process: A

Answers to choose from

A. Aspect Ratio
B. Photolithography
C. /100/
D. (100)
E. Scalloping
F. Hillock
G. Isotropic
H. {100}
I. <100>
J. Ashing
K. Stiction
L. TMAH
M. Czochralski
N. BELST

4) Identify the type of Si wafer (doping and Miller Index) depicted below **(5 points)**:



p-type
(111)

5) What is the maximum number of 0.5μm particles per ft^3 in a class 250 cleanroom **(5 points)**?

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6) What is the coefficient of thermal expansion (CTE) **(5 points)**?

The relative amount of volumetric change of a material with a change in temperature

7) What is a Paschen curve **(10 points)**?

A plot of the electrical breakdown of a gas in terms of breakdown voltage vs. pressure times the electrode separation distance

8) Which machine would you use to deposit 0.5μm layer of aluminum on your Si wafer **(5 points)**?

LPCVD, Sputter System, Oxidation Furnace, DRIE

9) Which machine would you use to etch a hole through your Si wafer **(5 points)**?

LPCVD, DRIE, Asher, Thermal Evaporator

10) Which material would ***NOT*** be useful for wafer bonding **(5 points)**?

Wafer Grip, Photoresist, AuSn solder, XeF_2

11) A surface that water does ***NOT*** wet is **(5 points)**:

Hydrophilic, Hydrophobic, Hydrocephalus, Hydronic

12) Anodic bonding can be used to bond a Si wafer to **(5 points)**:

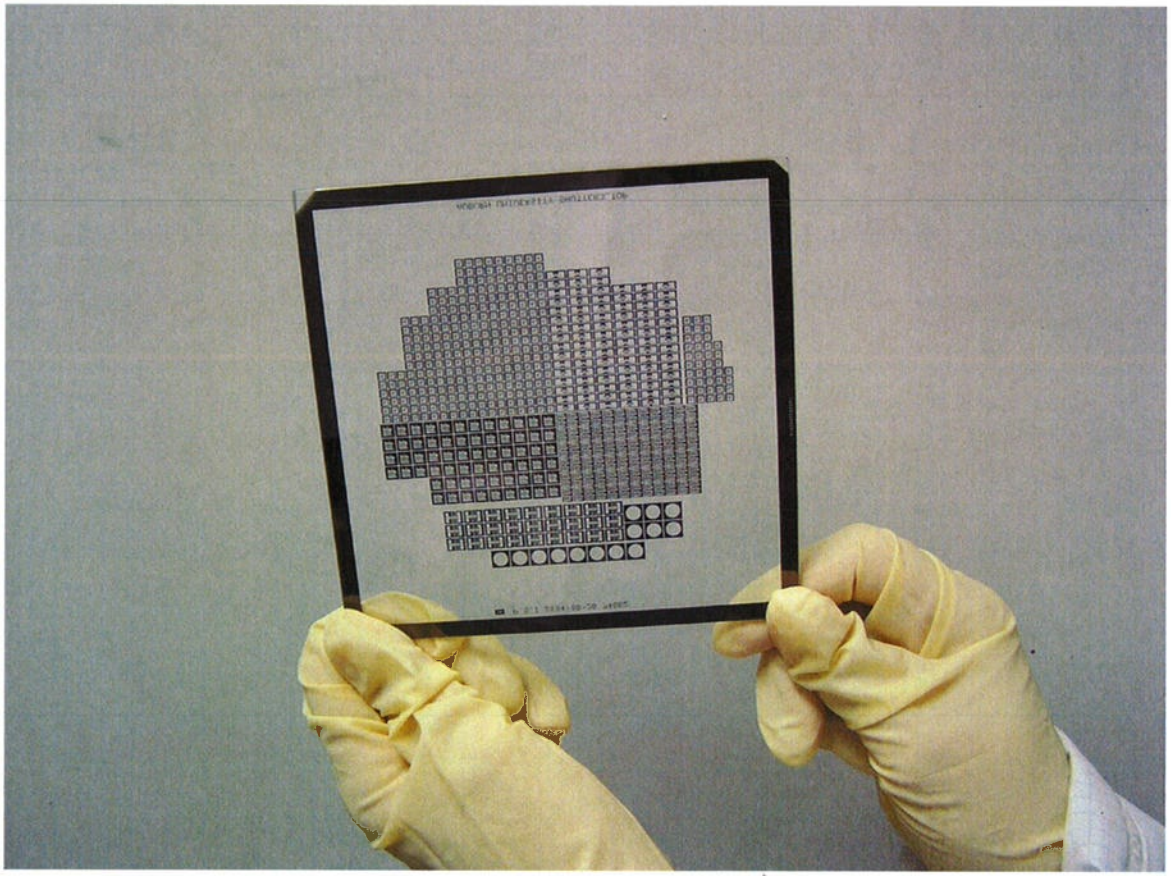
Pyrex, Silicon, Wood, Ceramic

13) Which process would you use to bulk micromachine a 100μm tall mesa into a 500μm thick (100) Si wafer **(5 points)**?

E-Beam Evaporation Electroplating, Timed KoH Etch, Wafer Bonding

Bonus Question (5 points)

What is this a photograph of?



A photolithography mask

Blank sheet if needed.