

**STANFORD NANOFABRICATION FACILITY  
POLICIES, PROCEDURES, AND SAFETY TEST**

**Name:**

**Date:**

**Organization/Department:**

**Email:**

**Phone:**

**Grade:                    Pass or No-Pass**

Passing this test is a requirement for access to the lab. All the information in this test appears in the Intro and Safety Lab Manuals and on the SNF website. Please return the completed test to the Lab Administrative Services Coordinator (in CIS 41).

(And yes, this is hard and some of the questions are tricky – but every scenario presented here is taken from a real-life situation in the lab – so please try to think of this as a virtual in-the-lab experience!)

1. Number the following in order of sequence for gowning:

- \_\_\_\_\_ Put on lab glasses
- \_\_\_\_\_ Put on bunnysuit
- \_\_\_\_\_ Put on vinyl outer gloves
- \_\_\_\_\_ Put on paper bouffant cap
- \_\_\_\_\_ Put on blue shoe covers
- \_\_\_\_\_ Put on booties
- \_\_\_\_\_ Put on latex (or vinyl) inner gloves
- \_\_\_\_\_ Log onto Coral
- \_\_\_\_\_ Put on hood

2. Which of the following materials are cleanroom compatible (and therefore may be brought into the lab)? Please mark acceptable materials with an "X".

- |  |  |
|--|--|
| _____ Pencils                          | _____ Laptop computer                      |
| _____ Erasers                          | _____ Cell phone                           |
| _____ Ball point pen                   | _____ Pager                                |
| _____ Newspaper                        | _____ Cardboard box, for storage           |
| _____ Cleanroom paper                  | _____ Labeled plastic toolbox, for storage |
| _____ Bottle of drinking water         | _____ Wafers                               |
| _____ Can of soda                      | _____ Tweezers                             |
| _____ Paperback novel                  | _____ Kleenex tissues                      |
| _____ Issue of Science magazine        | _____ Single edge razor blade              |
| _____ CD's                             | _____ Wafer cassette and cassette box      |
| _____ Floppy disk                      | _____ Scissors                             |
| _____ Plastic bags, for carrying items | _____ Cleanroom lab notebook               |

3. SNF recommends the following eye protection:

- a. impact-resistant safety glasses with side shields
- b. vented safety goggles (which can be worn over prescription, non-safety rated glasses)
- c. full face shield over safety glasses, which working with hazardous liquid chemicals
- d. prescription safety glasses
- e. all of the above

4. Calcium gluconate is found at every wet station in the lab where HF is used. Calcium gluconate is:

- a. used to detect HF in unknown drips or spills
- b. used as an antidote for HF exposure to the skin
- c. a by-product of the HF etching process
- d. used for HF spill cleanup
- e. none of the above

5. The Evacuation Assembly Point for SNF and the CIS/CISX buildings is located:
  - a. by the CoGen plant
  - b. at the fountain in the Packard building courtyard
  - c. next to the Ginzton Applied Physics building
  - d. at the entrance of Parking Structure 2
  
6. Empty containers of sulfuric acid should be:
  - a. rinsed and then placed in the chemicals pass-through, in the shelves marked by red tape.
  - b. left unrinsed, but just placed in the chemicals pass-through, in the shelves marked by red tape.
  - c. rinsed and then placed in the designated plastic bins on top of the Flammables cabinet in the service area.
  - d. rinsed and placed in any waste can in the lab.
  - e. any of the above.
  
7. Which of the following statements is **NOT** true? (There may be more than one statement!)
  - a. Chemicals (other than standard lab squeeze bottles) must be transported using transfer carts or individual chemical bottle carriers.
  - b. The metal transfer carts are used for transporting solvents, resists, and developers.
  - c. The white plastic polypropylene carts are used for transporting acids, bases, and corrosives, but may also be used for transferring solvents and other chemicals when no metal carts are available.
  - d. Transfer carts may be used for storing extra chemicals.
  
8. Information about the chemicals in the lab can be found:
  - a. in MSDS binders, located next to the Stockroom/Shipping & Receiving area
  - b. on the SNF website
  - c. on the Stanford University EH&S website
  - d. by asking an SNF staff member
  - e. all of the above
  
9. I open a box of plain silicon test wafers and several of them are broken. The best way to dispose of them is:
  - a. in one of the regular trash cans in the lab
  - b. to wrap them up in clean wipes, then put into one of the regular trash cans
  - c. in the "Sharps" collection box, located in the service area
  - d. to take them with me out of the lab, and put into the regular trash
  - e. to double-bag as hazardous solid waste and place in the chemicals pass-through for pickup
  - f. none of the above

10. I have some clean room wipes that were used to clean up a small amount of spilled photoresist. The wipes should be disposed of:

- a. by allowing them to dry under the solvent hood, then placing in the regular trash
- b. by placing in the Solid Flammable waste container, under the solvent bench in the Litho area
- c. by wrapping in a plastic bag, to prevent fumes, then placed in the Solid Flammable waste container
- d. photoresist is non-toxic, so solid waste can be placed directly in the regular trash
- e. a and c only

11. As I am working in the lab, the fire alarm is activated.

- a. If I am processing material, I should stop as soon as I reach a convenient stopping point and then leave the lab.
- b. I should leave the lab through the gowning room, quickly removing my bunnysuit, leaving it on the bench, so I can pick it up when I return.
- c. I should stop whatever I am doing immediately.
- d. I should leave the lab through the nearest exit, not bothering to remove my bunnysuit.
- e. a and b
- f. c and d

12. From the list on the following page, indicate the appropriate response to each of the following situations here:

\_\_\_\_\_ I see a large, steadily growing, puddle of water in the service area of the lab.

\_\_\_\_\_ There is a faint, engine-like smell in the lab.

\_\_\_\_\_ There is a tank of chemical on fire at a wet station.

\_\_\_\_\_ I've accidentally knocked over a large bottle of chlorobenzene. There is a very large puddle and it smells very bad.

\_\_\_\_\_ There is liquid dripping from the ceiling.

\_\_\_\_\_ My coworker has just collapsed and is not breathing.

\_\_\_\_\_ My coworker has just slipped and hurt his ankle.

\_\_\_\_\_ My coworker has just slipped and appears to have hurt his back.

\_\_\_\_\_ My coworker has just cut his finger with a box cutter.

- a = This is a “Life-threatening” medical emergency. Dial 9-911 immediately and do not hang up until told to do so. Do not move the victim unless necessary.
- b = This is a “Non-health threatening” emergency. During working hours, call SNF Maintenance staff or Facilities. After hours, call Work Control (3-2281) and notify SNF Primary Contacts.
- c = This is a “Health Threatening Emergency” requiring evacuation. Pull the fire alarm and then evacuate to the EAP.
- d = This is a “Major Chemical Spill.” Call for spill cleanup assistance (during normal working hours, call SNF maintenance staff; after hours, call EH&S (at 5-999) and notify SNF Primary Contacts. Clear the area, and if necessary, use the intercom to clear the lab.
- e = This is a “Minor Chemical Spill.” Clear and isolate the immediate area. Notify SNF staff member. Obtain cleanup materials from the lab Spill Cart and follow safety procedures to clean up the spill.
- f = This is not an emergency, but could be a serious concern. Call an SNF staff person.
- g = This is a non-life threatening injury. Escort the victim to a designated medical provider or emergency room. An accident report needs to be completed.

13. When introduced during processing, organics and metals have the ability to destroy electronic devices. The system of “equipment groups” was designed to try to minimize the possibility of contamination in the electronics processing tools. Using the “equipment groups” definitions, use an “X” to indicate the acceptable process sequences. (Detailed “equipment group” info is available on the SNF website. Coral equipment names are indicated in **bold**.)

\_\_\_\_\_ Clean silicon wafer -> oxidation (**tylan1**) -> standard photolithography -> **mrc** oxide etch -> photomask removal in **wbnonmetal** -> nitride deposition in **tylannitride**

\_\_\_\_\_ Clean silicon wafer -> oxidation (**tylan1**) -> standard photolithography -> **amtetcher** oxide etch -> photomask removal in **wbnonmetal** -> nitride deposition in **tylannitride**

\_\_\_\_\_ Clean silicon wafer -> oxidation (**tylan1**) -> standard photolithography -> **mrc** etch -> photomask removal in **wbnonmetal** -> nitride deposition in **stsdep**

\_\_\_\_\_ Clean silicon wafer -> oxide deposition in **sts** -> standard photolithography -> **amtetcher** oxide etch -> photomask removal in **wbnonmetal** -> nitride deposition in **stsdep**

\_\_\_\_\_ Clean silicon wafer -> oxide deposition in **sts** -> standard photolithography -> **mrc** etch -> photomask removal in **wbnonmetal** -> nitride deposition in **stsdep**

\_\_\_\_\_ Clean silicon wafer -> oxide deposition in **tylan1** -> standard photolithography -> **p5000etch** -> photomask removal in **wbnonmetal** -> nitride deposition in **tylannitride**

\_\_\_\_\_ Clean silicon wafer -> oxide deposition in **tylan1** -> standard photolithography -> **mrc** etch -> photomask removal in **wbgeneral** -> nitride deposition in **sts**

14. True or false

\_\_\_\_\_ I have a beaker containing a liquid chemical. I don't have to use a chemical cart, but can carry the beaker by hand between stations in the lab, provided the chemical is approved for use at these stations and the beaker is labeled and covered.

\_\_\_\_\_ I am allowed to store personal chemicals in my personal storage bin, provided the chemical is not flammable, its container has a secure cover, and it is properly labeled.

\_\_\_\_\_ I am allowed to hand-carry one of the standard lab-provided, labeled plastic squeeze or spray bottles (containing acetone, isopropanol, or methanol) between stations in the lab.

\_\_\_\_\_ I am permitted to wear sandals in the lab, provided the heels are secured with a strap.

\_\_\_\_\_ I must not work in the lab alone, even during off-hours or during the weekend.

\_\_\_\_\_ Any injury must be reported to the Stanford University Department of Risk Management.

\_\_\_\_\_ I may bring in a chemical that is not on the approved SNF chemicals/materials list, provided I have its MSDS sheet and use it in chemically compatible station.

\_\_\_\_\_ The very first step in response to any hazardous liquid chemical exposure to the skin or eyes is to rinse the affected area with lots of water.

\_\_\_\_\_ If I accidentally expose my hand to a corrosive liquid chemical, I can use the DI spray gun or the wafer dump rinser to rinse it.

\_\_\_\_\_ I would like to bring in a power supply to set up an electrochemical plating process in one of the wet benches. Since I am very familiar with the setup from my previous lab, I do not require help, so do not need to inform the SNF staff.

\_\_\_\_\_ I have a bottle of chemical that is approved and used by many people in the lab. The bottle does not require a yellow "personal chemical" sticker if I label it with the appropriate information (name, date, composition, storage code) and store it in the appropriate location.

\_\_\_\_\_ Aspirators are located at each acid/base wet station and are used to safely dilute and "vacuum" chemical waste into the AWN (Acid Waste Neutralization) holding tank.

15. Indicate the appropriate Primary Hazard for the following gases:

<b>Gas name</b>	<b>Primary Hazard(s)</b> a=pyrophoric b=corrosive c=highly toxic d=non-toxic
Nitrogen (N <sub>2</sub> )	
Sulfur hexafluoride (SF <sub>6</sub> )	
Silane (SiH <sub>4</sub> )	
Carbon tetrafluoride (CF <sub>4</sub> )	
Phosphine (PH <sub>3</sub> )	
Dichlorosilane (SiH <sub>2</sub> Cl <sub>2</sub> )	
Ammonia (NH <sub>3</sub> )	

16. Multiple choice (an answer may be used more than once or not at all!)

<u><b>Alarm Type</b></u>	<u><b>Appearance</b></u>	<u><b>Response</b></u>
Fire	_____	_____
Toxic gas, level 1	_____	_____
Toxic gas, level 2	_____	_____
Acid Waste Neutralization	_____	_____

Appearance when activated:

- a= flashing yellow light
- b = flashing blue light; loud klaxon alarm
- c = flashing white light; loud klaxon alarm
- d = flashing yellow light; sounds alarm
- e = none of the above

Response:

- a = evacuate the lab and meet in the office area outside the lab
- b = stop using wet sinks immediately
- c = evacuate the building and meet at the Evacuation Assembly Point (EAP)
- d = call 9-911

17. Effective, open communication in the lab is key to the success of SNF. For the following statements, choose the best of these options:

- a = email to [safety@snf](mailto:safety@snf)
- b = email to [specmat@snf](mailto:specmat@snf)
- c = email to [labmembers@snf](mailto:labmembers@snf)
- d = email to **tylannitride@snf**
- e = contact staff member
- f = none of these

- \_\_\_\_\_ My wafers contain zirconium oxide film deposited outside of SNF. How do I find out if and how these can be processed in the **tylannitride** furnace?
- \_\_\_\_\_ I am doing my thesis defense on optical MEMS devices. I would like to make an announcement to invite people to come.
- \_\_\_\_\_ I would like to find a source for depositing zirconium oxide on silicon wafers, since SNF does not have a system that can do this.
- \_\_\_\_\_ I have a suggestion for improving safety in the lab.
- \_\_\_\_\_ I would like to use one of the spin coaters to deposit a new spin-on-glass material that I would like to characterize. Which system can I use?
- \_\_\_\_\_ I would like to find advice on the best planarization methods for high aspect ratio silicon trenches.
- \_\_\_\_\_ I was working late at night and observed someone carrying chemicals around the lab in open beakers, in violation of lab policy. Who should I notify?
- \_\_\_\_\_ I would like to recruit a process engineer for my startup.
- \_\_\_\_\_ I would like to sell my car.
- \_\_\_\_\_ I am finished with my project and would like to give away my extra SOI wafers to someone who could use them.
- \_\_\_\_\_ I have two wafers that I would like processed in the **tylannitride** furnace. I don't want to do a run myself for only two wafers, and am wondering how I can find anyone else who would like to process their wafers with mine.