Introduction to Biotechnology: Custom Lab

Lab 1: Lab Equipment Check-Out, Safety Quiz and Student Survey

Version 3-17-12

For more information on College of the Canyons Introduction Biotechnology course, contact
Jim Wolf, Professor of Biology/Biotechnology at (661) 362-3092 or email:
jim.wolf@canyons.edu

I. Objectives

1. Understand broad categories of items used in biotechnology labs and explain the category rational.
2. Be able to provide 1-2 category specific concerns with respect to lab safety
3. To become familiar with the location, function and to some extent the disposal of various laboratory equipment, supplies and reagents.
Develop a list of lab items, locations and functions for use during remaining biotechnology labs.
4. To demonstrate your knowledge of laboratory safety by taking a lab safety quiz.
5. Complete a brief survey of coursework taken for purpose of developing working groups of students for biotechnology lab work.

II. Background:

During the semester you will be responsible for setting up and reviewing the key aspects of your experiments. In order to do this, you will need to know the names of the various types of equipment and supplies, their uses, and where they are stored. This worksheet is designed to help you with this information. Keep your descriptions brief, and maybe consider using a diagram or other useful drawing to help you to remember what the item looks like. You can work collaboratively on this exercise, and do not hesitate to ask questions if you want to confirm the identity, location or use of an item. After you have completed this assignment, let me look at it, and keep this handy (place in your notebook in a conspicuous location) for easy reference. Here are a few additional hints.

- Use the lists and signs. In most labs there are lists to help identify item type, location, etc. There are laminated spreadsheets located near the two sinks in the biotech lab in addition to numerous signs and labels.
- Work in pairs or small groups and start with familiar items. Some items may have moved or have multiple names. **Do not freak out**. This will become familiar as you work with the items.
- Work quickly. There are over 55 items and you need to survey and move on. Remember, you are writing down, drawing key ideas and then using this resource later. You are not studying for an exam, you are making a resource.

Categories of items:

The following ideas are just tools to help you keep track of items. Its helps to lump them into groups; as this makes conceptualizing their role and use easier. Some items clearly belong to a category (i.e. a beaker helps to hold a defined volume of liquid) so is in the V category for volumetrics Other items do not fit so nicely and some categories are quite artificial. This said, take theses at face value and feel free to modify, update, change if you find a more effective way of categorizing things. Be sure to share your ideas so that the whole class can benefit from your approach.

V: Volumetrics: devices designed to hold or transfer a defined volume of liquid. As you might imagine, biology deals with a LOT of volumetric devices.

M: Metric. Device designed to measure the other metric units common in lab including length, mass and temperature.

E: Equipment includes electrical and mechanical devices of some complexity. Quite arbitrary group in some respects.

S: Storage: Another arbitrary group for holding or helping to handle some items either for a few minutes (i.e. test tube racks and microfuge bins) or for indefinite period of time (like a freezer or incubator).

D: Disposal: A specialized group of items focusing on the need for controlled disposal of almost everything in a biotechnology lab from culture dishes to chemicals. Chemical for disposal need to be specially marked and

are often stored in fume hoods or chemical cabinets prior to disposal. Biohazard items are placed into special and promptly autoclaved according to protocol. Some additional safety items are placed in this group FYI.
R: Reagents: Chemicals, media, ice and other items that are consumed by cells, used for detection, assessment, etc are included in this category. These are often stored in chemical supply cabinets, freezers, etc, where great care is taken to ensure storage is safe and that like chemicals are stored together to avoid cross reactivity.

Biotech Laboratory Equipment:

V: Volumetrics: devices designed to hold or transfer a defined volume of liquid. As you might imagine, biology deals with a LOT of volumetrics devices. Numbers 1 -22

Item (category)	Description (sizes/uses)	Location
1.Beakers (V)		
2.Pipettes (serological) (V)		
3.Microcentrifuge tubes (non-sterile) (V)		
4.Microcentrifuge tubes (sterile) (V)		
5.Centrifuge tubes (V)		
6.Pipette tips (non-sterile) (V)		
7.Pipette tips (sterile) (V)		
8.Pipette pump (V)		
9.Pipette aid (V)		
10.Flasks (V)		

Biotech Laboratory Equipment: continued

V: Volumetrics: devices designed to hold or transfer a defined volume of liquid. As you might imagine, biology deals with a LOT of volumetrics devices. Number 1 -14

Item (category)	Description (sizes/uses)	Location
11.Graduated (V) cylinders		
12. Sterile transfer pipette (V)		
13. Tissue culture flask (V)		
14. Sterile inoculating loops (plastic) (V)		

M: Metric: devices designed to measure the other metric units common in lab including length, mass and temperature. Numbers 15-19.

Item (category)	Description (sizes/uses)	Location
15. Balances (M)		
16. Plastic ruler (M)		
17. Analytical balances (0.1 to 0.0001 gram range) (M)		
18. Weighing boats (M)		
19. Weighing papers (M)		

E: Equipment includes electrical and mechanical devices of some complexity. Quite an arbitrary catagory in some respects. Numbers 20-31.

Item (category)	**Description (sizes/uses)**	**Location**
20.Stir platform (E)		
21. Stir bars (magnetic) (E)		
22. Horizontal gel box (E)		
23.Power supply (E)		
24. Clinical tabletop centrifuge (E)		
25. Microcentrifuge (E)		
26. Vertical gel box (E)		
27. Microwave (E)		
28. Vortexer (E)		
29. Tissue culture hood (E)		
30. Swinging bucket centrifuge (E)		
31. Gel electrophoresis combs and rigs (E)		

S: Storage: another arbitrary group for holding or helping to organize items either for a few minutes (i.e. test tube racks) or for indefinite period of time (like an incubator). Numbers 32-41.

Item (category)	Description (sizes/uses)	Location
32.racks misc. (S)		
33.Tissue culture incubator (S)		
34.Bacterial incubator (S)		
35. Test tube multi-rack (S)		
36. Fume hood (S)		
37. Water bath (S)		
38. Dry shaking bath (S)		
39. Floating microfuge rack (S)		
40. – 4 ^{o}C microfuge rack (S)		
41. -- 20 ^{o}C microfuge rack (S)		

D: Disposal: a specialized group of items focusing on the need for controlled disposal of almost everything in a biotechnology lab from culture dishes to chemicals. Chemicals marked for disposal need to be specially labeled and are often stored in fume hood or chemical cabinet. Biohazard items are placed into special and promptly autoclaved according to protocol. Some additional <u>safety items</u> are placed in this group FYI. Numbers 42-48.

Item	Description (sizes/uses)	Location
42. Telephone (D)		
43. Eyewash (D)		
44. Sanisol (sterilizing solution) (D)		
45.Thermal gloves (D)		
46. Acid/base neutralizer (D)		
47. Biohazard disposal container (D)		
48. Serological pipette disposal tray (D)		

R: Reagents: Chemicals, media, ice and other items that are consumed by cells, used for detection, assessment, etc. Often stored in chemical supply cabinets, freezers, and great care is taken to ensure storage is safe, and that similar chemicals are stored together to avoid cross reactivity. Numbers 49-57.

Item	Description (sizes/uses)	Location
49. Reagents (R)		
50.Ice (R)		
51. Loading dye (R)		
52. Insect cell media (R)		
53. Lab-line marker (R)		

R: Reagents: Chemicals, media, ice and other items that are consumed by cells, used for detection, assessment, etc. Often stored in chemical supply cabinets, freezers, and great care is taken to ensure storage is safe, and that similar chemicals are stored together to avoid cross reactivity. Numbers 49-57.

Item	Description (sizes/uses)	Location
54. Autoclave tape (R)		
55. Masking tape (R)		
56. Petri dishes with media (R)		
57. Ethyl/isopropyl alcohol spray bottle (R)		

Category specific safety concerns: Since the categories are somewhat artificial and arbitrary, the following ideas too are relatively broad and may have exceptions or not necessarily apply. This said, they are useful to get you thinking about safety. The odd thing about safety is that if you study it and stress over it, you are more likely to be less safe! It is more about big ideas and common sense than it is about mind-numbingly specific details. This said, if you ask, I will tell my lawyers I never said this and that lab safety should be study intensely and every day!

Volumetric: Consider what the device came in contact with. Should it be simply washed or disposed of? In the trash or in a biohazard container? Serological pipettes are disposed of in special trays as they often poke through biohazard bags, created another hazard.

Metric: The data can be altered in the device lacks with precision or accuracy. A precise device gives the same result each time and an accurate device will give a number close the real value. Overtime, you will learn to be critical of metric values and spot deviations. If 4 beakers weight 100 grams and a 20 grams, right away, suspisicion is warranted. When every you are doing something for the first time, try to be really careful with values and units. Do the units/values make sense?

Equipment: Most pieces of equipment have specific protocol for operation (often posted right next to device. Take time to learn the details. Also, consider general electrical issues (e.g. do not operate with wet hands, etc) and report any malfunction immediately and conspicuously label the equipment as broken or needing attention. DO NOT ASSUME SOMEONE ELSE WILL LOOK INTO IT!

Storage: Label everything clearly. Pay particular attention to chemical storage. Always ask if unsure avoid storing things in locations not designed for it (i.e. chemicals should not be stored in fume hoods, cells not in tissue culture hood, etc..)

Disposal: Few things go into the garbage. Sink disposal too in difficult. Only pour down sink if directed to do so. Often items may require some treatment prior to disposal (sterilization, chemical neutralization).

Reagents: This is a very exacting science. If not done correctly, at the least, you may have difficulty locating needed reagents, at the worst, it can kill you! Many institutions have specially trained personally to deal with the storage, disposal, handling of chemical inventory.

Safety Quiz: Name_____

1. True / False Broken glass should be placed in the trashcan.
2. True / False In addition to magnification, a microscope can heat up a specimen.
3. True / False Inches, feet and gallons are valid units in a science lab.
4. True / False In the event of an accident, only consult the instructor if severe.
5. True / False To dilute an acid, add acid to water (as opposed to adding water to acid.)
6. True / False Pipetting by mouth is acceptable if the solution is non-toxic.
7. True / False When pushing a pipette into a rubber stopper, grasp the pipette at the end opposite the stopper.
8. True / False Burns from both acids and bases cause a strong burning sensation.
9. True / False Food and drink are permitted in lab.
10. True / False When heating a test tube, point the tube directly at your lab partner.
11. True / False When an accident occurs and the professor is not around, call 911 immediately.
12. True / False Hot glass looks like cool glass.
13. True / False All chemicals should be treated as deadly.
14. True / False Animal tissues should be disposed of in the garbage.
15. True / False When getting chemicals from the lab cart, it is acceptable to take the chemical to your lab bench.
16. True / False To save time, you should samples from the lab cart to your lab bench
17. True / False In the event of an alcohol fire, use water to extinguish.
18. True / False When conducting an experiment, the organism should be kept alive if possible.
19. True / False When dissecting a specimen, use the scalpel to probe with.
20. True / False When in doubt, do not bother to ask.

Biotechnology Working Group Development Form: Name_____

Briefly describe why you are taking this class: _____

_____

What are your career goals? _____

_____

Have you every worked in a laboratory setting? If so, please elaborate:_____

_____

What other sort of job experience (paid or volunteer) have you had? _____

_____

On a scale of 1-10 (one being little and ten being lots), answer the following questions:

1. I am very comfortable the theory (lecture) part of Biology 107. ____
2. I am very comfortable with the lab activities in Biology 107. _____
3. I enjoy the challenges inherent in laboratory activities. _____
4. I enjoy the challenges inherent in lecture activities. ____
5. My writing skills are very strong. _____
6. My math skills are very strong. _____
7. I am very familiar with Excel spreadsheets. _____
8. I am very familiar with Microsoft word. _____
9. I feel comfortable reading a protocol and executing it. _____
10. I prefer to have someone show me how something works before I try it. _____
11. In lab, I am comfortable delegating jobs to my fellow students. _____
12. I enjoy working with my fellow students on lab activities. _____
13. My writing skills are very strong. _____
14. My note taking skills are very strong. _____
15. My analytical abilities are very strong. _____
16. I am familiar with most of the scientific equipment in this lab. _____
17. I am comfortable explaining protocol to fellow students. _____
18. I am comfortable asking questions during lecture. _____
19. I am comfortable asking questions during laboratory. _____
20. I am comfortable speaking in front of a classroom full of students._____

For the following list of courses, please identify those courses you have taken by bubbling in the corresponding area.

Algebra: O Trigonometry O Calculus 1: O 2: O 3: O Chemistry 201 O Chemistry 202 O

Microbiology O Physics O Biology 100 O Anatomy O Physiology O Molecular Biology O

Chemistry 265 O Chemistry 266 O Chemistry 151 O Biology 106 O Biology 230 O

Biology 240 O Physics (type)_____ O Other Science Courses, please list briefly:

_____