



Risk & Safety  
**TRAINING**

University of California

**Train the Trainer**

**ONLINE**

**INSTRUCTIONAL DESIGN**

Develop courses using backward design



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## Instructional Design

### Objectives

Every instructor has objectives he/she wishes to accomplish during training. Learning objectives should be participant-focused and state the desired learning outcome. Objectives should be identified for each training module that are measurable and observable. When constructing objectives, the main question that objectives answer is:

**What should the participant be able to do differently after the training is completed?**

Objectives should follow recognized models that aid in the construction of practical objectives, such as Bloom's Taxonomy, or Roger Mager's Theory of Behavioral Objectives.

### Backward Design



Backward Design strategy describes a process of designing curriculum and learning experiences to meet specified purposes. Beginning with the end in mind (objectives), the course author identifies evidence of learning (performance), and then produces training materials (content) that equip the learners to perform.

1. **Identify learning outcomes** (objectives). What are participants expected to understand, know, and do?
2. **Determine acceptable evidence** (performance). What would you accept as evidence that participants learned?
3. **Plan learning experiences and instruction** (content) and evaluation strategies. What activities will enable participants to achieve the outcomes (objectives)? How will they demonstrate what they can do?

## Assessments

### Comparison

Type	Pro/Con
Multiple Choice	<ul style="list-style-type: none"> <li>Easy to score</li> <li>Can cover lots of content</li> <li>Measures memorization</li> <li>Allows guessing</li> </ul>
Fill in the blank	<ul style="list-style-type: none"> <li>Easy to score</li> <li>Limits guessing</li> <li>Harder to score</li> <li>Numerous answers may work</li> </ul>
Essay	<ul style="list-style-type: none"> <li>Measures knowledge</li> <li>Difficult to score</li> </ul>
Observation	<ul style="list-style-type: none"> <li>Better evidence of skills</li> <li>Engaging for students</li> <li>Difficult to develop checklists</li> <li>Time consuming to score</li> </ul>

## Visual Design

### Guidelines

Themes	<ul style="list-style-type: none"> <li>Simple design</li> <li>Use lots of white space</li> <li>Insert active learning questions (What do you think? How would you respond? What's wrong with this picture?)</li> </ul>
Design	<ul style="list-style-type: none"> <li>One concept per slide</li> <li>More images, less text</li> <li>Contrast colors</li> </ul>
Font	<ul style="list-style-type: none"> <li>Large font sizes (26 pt.)</li> <li>Limit to two fonts per slide</li> <li>Use plain text (limit use of bold, italics, or underline)</li> </ul>
Image	<ul style="list-style-type: none"> <li>Chose similar images (use either clipart OR photos)</li> <li>Layouts or diagrams bring them into actual scenarios they will encounter</li> <li>Call-outs emphasize important aspects</li> </ul>

## Resources

### EH&S Training

#### Best Practices, Standards and Guidelines

Available online at <http://stew.ucdavis.edu> (click on "Standards & Guidelines").

By the end you should be able to:

## 1. Design courses using:

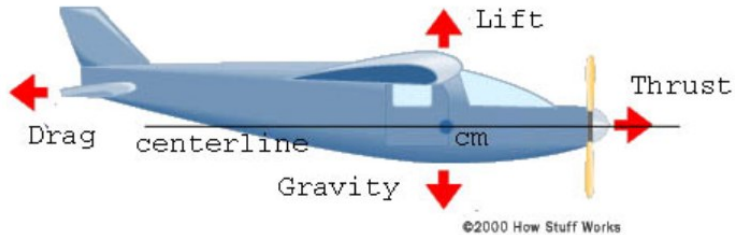
- Instructional design
- Visual design
- Assessments

**Design**

**What is your process  
for developing  
courses?**



# TRAINING vs. EDUCATION | INSTRUCTIONAL DESIGN



## Training

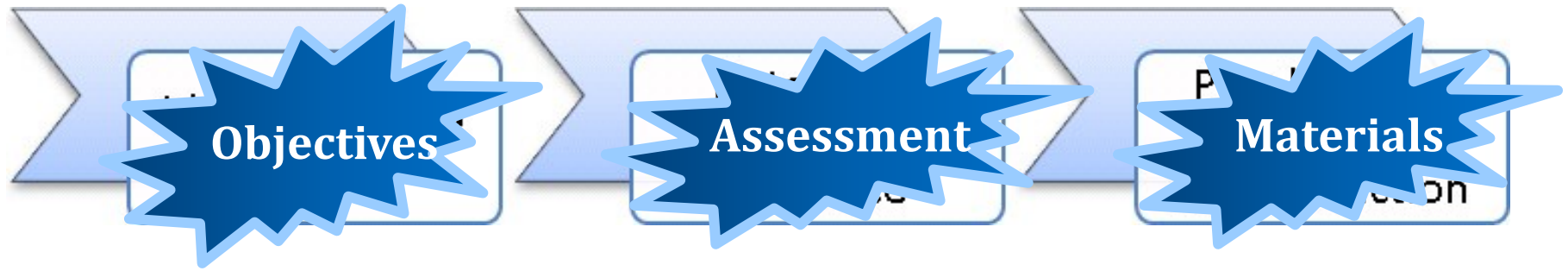
is about answers,  
about how to do it,  
and

## Education

is about questions,  
about why to do it.

- Ben Ponder

## Backwards Design



Design your courses by working backwards starting with your objectives.  
Then develop an assessment, followed by training materials to support achievement of those tests,

Where should you look to develop objectives?



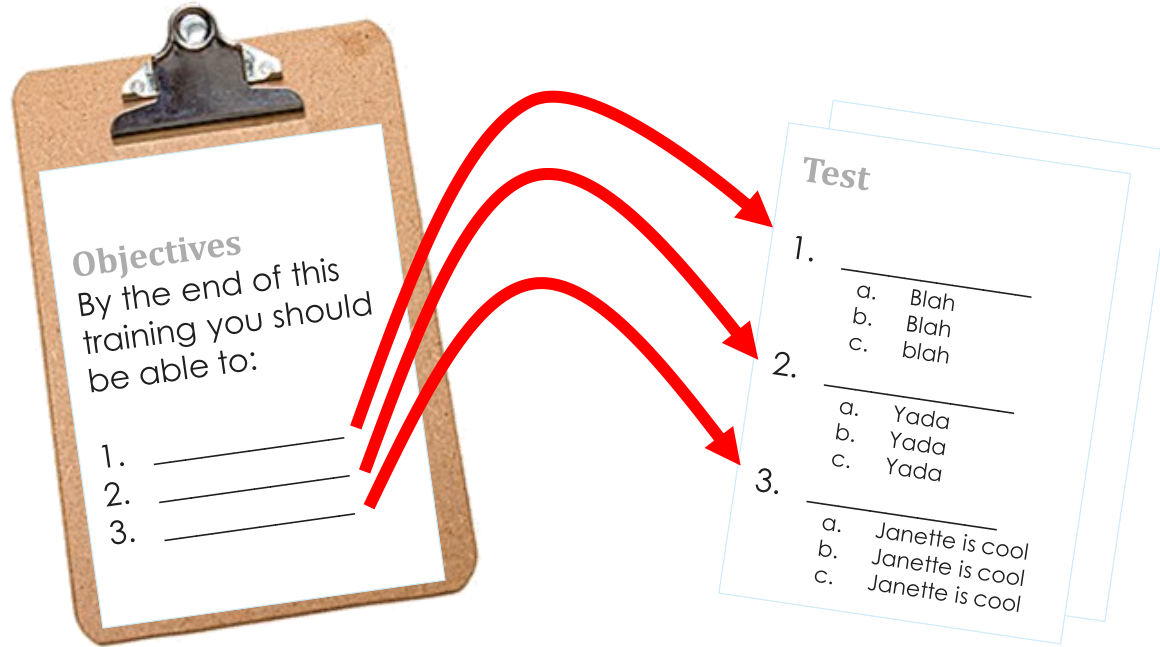
**Standards  
and Regulations**



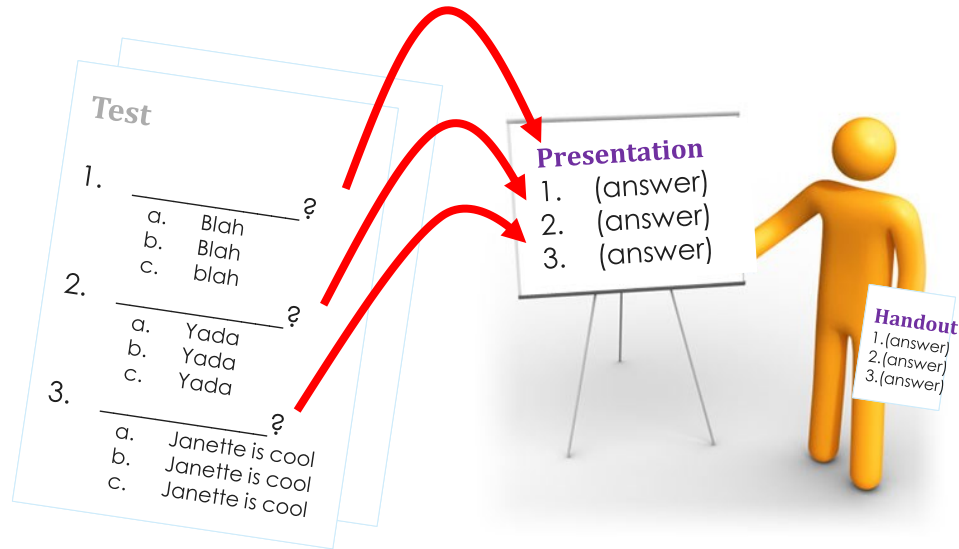
**Injuries  
and Illnesses**



**Inspection  
findings**







## EXAMPLE Fire Extinguisher Training

**Objectives**

**Assessment**

**Materials**

**By the end of this training  
you should be able to:**

Use PASS to  
operate a fire  
extinguisher.

## EXAMPLE Fire Extinguisher Training

### Objectives

**By the end of this training  
you should be able to:**

Use PASS to  
operate a fire  
extinguisher.

### Assessment

When using a fire  
extinguisher: Pull,  
\_\_\_\_, Squeeze,  
and Sweep.

### Materials

# EXAMPLE Fire Extinguisher Training

## Objectives

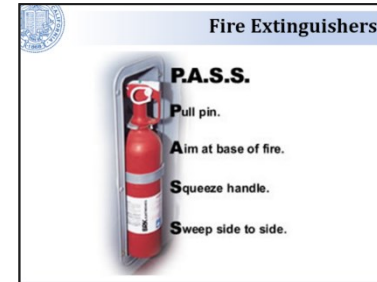
By the end of this training  
you should be able to:

Use PASS to  
operate a fire  
extinguisher.

## Assessment

When using a fire  
extinguisher: Pull,  
\_\_\_\_\_, Squeeze,  
and Sweep.

## Materials



# EXAMPLE Fire Extinguisher Training



## Objectives

## Assessment

## Materials





By the end of this training you should be able to:

1. Differentiate between Rad/Bio/Laser and (Chemical) Hazard Class signs.
2. Identify the minimum PPE to wear in a laboratory.
3. Use emergency equipment.

Test

UOP | Environmental

8. Draw a line matching the equipment and how to use it.

	<b>Fire Extinguisher</b> Pull Aim Squeeze Sweep
	<b>Safety Shower</b> Pull the handle to turn on Wash for 15 min. Release handle to stop Remove affected clothing
	<b>Fire Alarm</b> Pull the handle (down) Evacuate building
	<b>Eyewash Station</b> Put face and eyes in proper location Turn the lever on Wash open eyes for 15 min. Turn the lever off

9. What should you do when entering a laboratory?

- a. Finish someone else's experiment
- b. Identify the location of the nearest emergency exit (for the laboratory and building)
- c. Use a fire extinguisher, even with there isn't a fire
- d. Walk around with bare feet

10. In case of an injury you should seek medical attention, notify your \_\_\_\_\_, and make sure to complete an "Incident and Investigation Report."

- a. Chancellor
- b. Graveyard digger
- c. Insurance company
- d. Supervisor

Signs and Labels

Fume hood exhaust stacks are located on the roof, which are generally 7 feet above the railing surface (bottom). If a sudden and unexpected odor is encountered while working in the hood, you should leave the immediate area immediately and inform EHS. If involving on a particular exhaust system for an active laboratory, a "Do Not Use" sign should be posted and laboratory personnel should be informed.

**Do not use**

**Unoccupied spaces**  
The majority of renovation work involving contractors takes place in unoccupied laboratories which have all hazardous materials, equipment and fixtures removed in preparation for construction with specific requirements, or for structural upgrades.

When a research group vacates a laboratory, a clearance survey is performed to assure that hazards are not left behind. Laboratory staff reserves all their materials, decontaminate surfaces, and wipe-down areas when work was performed. EHS staff conducts a walk-through inspection. The departing research group should not be granted clearance until all potential hazards are removed. (Hazardous waste equipment clearance sign, do not proceed until communicating with EHS). Some lab-hazardous materials go undetected until renovations are underway. These may include finding broken glass, needles, or small amounts of mercury spilled in drains. Sometimes the inside of a fume hood should always be considered to have some contamination. Note that mercury must be given to EHS for proper disposal. Contact laboratory personnel for any hazards that might be discovered during the course of work and report for authorization.

**Emergency Clearance Sign (Hazardous Sample)**

**Emergencies**  
Know how to use emergency equipment  
One of the things you should do when entering a laboratory is identify the location of the nearest emergency exit for the laboratory and building and locate the emergency equipment. The following is common equipment you will find, and how to use it.

Fire Extinguisher	Eye Wash
1. Pull the handle to turn on	1. Put the face and eyes in proper location
2. Aim	2. Turn the lever on
3. Squeeze	3. Wash open eyes for 15 min.
4. Sweep	4. Turn the lever off

**What should you do if an emergency occurs?**

**Fire**

1. "Sound the alarm"
2. Notify others
3. Clear building from the alarm and get out
4. In case of a small fire in your area, use a fire extinguisher if you have been trained to do so. If the fire is small enough that you are not endangering yourself, there are trained staff who can assist you.
5. If you see a laboratory area, use work, and materials of equipment in the building and use the appropriate fire extinguisher to extinguish the fire before entering the building.
6. If a container of a chemical, biological, or radioactive material is broken, do not attempt to clean it up. Notify EHS immediately and secure the area. Do not enter the area until EHS personnel arrive.
7. Notify others
8. In case of a spill, do not enter the area until EHS personnel arrive. Do not enter the area until EHS personnel arrive.
9. Notify others
10. In case of a spill, do not enter the area until EHS personnel arrive. Do not enter the area until EHS personnel arrive.

**Spill**

**Injury**

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# EXAMPLE Laboratory Safety Training



## Laboratory Safety Awareness

Information for Facilities, Maintenance, Contractors, and any individual working around laboratories

### Objectives

Introduction to potential hazards that may be encountered while working through, or around, a laboratory.

By the end of this course you should be able to:

1. Differentiate between Radio Bio Clean and Flammable Reactive Corrosive
2. Prepare for common hazards you'll find in the laboratory (Signs and Labels)
3. Know eating, drinking, smoking, applying cosmetics, or fiddling with contacts
4. Store tools and equipment in proper areas (Work Practices)
5. Avoid contaminated areas (Work Practices)
6. Wear closed toe shoes, gloves, body coverage, and eye protection (Protective Clothing)
7. Identify additional minimum PPE required based on placards (Protective Clothing)
8. Be familiar with the use of emergency equipment (Emergency)
9. Locate the nearest exit (Emergency)
10. Seek medical attention in case of injury. Report all injuries to supervisor.

As an employee it is your responsibility to ensure that your activities are conducted safely. If your questions are not answered by this publication, please contact EH&S. We endeavor to conduct work here in a safe and healthful manner for you, your visitors,

### Working in a laboratory

#### Recognize hazards

Before entering the laboratory, make sure to look through the glass door, or window, to acquire yourself with what is going on inside. One of the first things you should do when entering a laboratory is to identify the location of the nearest emergency exit (for the laboratory and building) and locate the emergency equipment. Once inside a laboratory, you will see whether active work is being done. If there are researchers at work, explain what you see there to do ask. If you should be concerned with any special hazards. If hazardous equipment is in operation, hazardous supplies or hazardous wastes are present, or experiments are in progress in the area you need to work, call the laboratory staff to cover them. Never wear any equipment, chemicals, or other containers without the direct permission and instruction of laboratory personnel, or EH&S.

Remember to report the individual safety rules of the laboratory. It is for your protection.

#### Communicate with laboratory personnel

Many experiments in the laboratory use dry, wet, and sometimes corrosive to set up and complete. If your work might disrupt any of the researchers' work, they should be notified well in advance. Let them know where, when, and how long your project will take. Inform laboratory personnel how what will be needed of them. Most researchers are willing to move their work to another area or conversation and experiments if given plenty of time.

#### Important contacts

For more information, or to report hazards, please contact:

Environmental Health & Safety  
Physical Plant  
UCPD (Police)  
(951) 827-6328  
(951) 827-4214  
(951) 827-0222  
<http://ehs.ucr.edu>  
<http://physical.ucr.edu>  
<http://ucpd.ucr.edu>

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Objective..... p. 1

## Signs and Labels

A variety of hazards exist in any particular laboratory or support area. The first indication of these hazards is the laboratory sign. Signs may indicate the presence of biohazards, chemical hazards, or other hazards. Some laboratories will have many chemicals. In normalcy, all activities will be shut down and the area decontaminated before contractors or laboratories are not considered high-hazard areas.

### Physical and Health Hazard Signs

Avoid working near waste containers or work surfaces labeled with the biohazard, warning sign. Check with your supervisor before beginning work.

Sign	If you see this sign you should...
	<ul style="list-style-type: none"> <li>• Report if the radiation laboratory is unsecured.</li> <li>• Never touch items with this symbol (they are potentially contaminated).</li> </ul>
	<ul style="list-style-type: none"> <li>• Maintain good health and hygiene habits (e.g., do not eat, drink, smoke, apply cosmetics, or fiddle with contact lenses in these areas).</li> <li>• Wash hands after work.</li> </ul>
	<ul style="list-style-type: none"> <li>• Remove personal jewelry before entering.</li> <li>• Verify with laboratory personnel that the lasers will not present a hazard and/or that they are turned off.</li> <li>• Be aware that some lasers are not visible.</li> </ul>
	<ul style="list-style-type: none"> <li>• Keep wet hands away from touching electrical equipment or switches.</li> <li>• Report signs of overloaded circuits including flickering or dimming lights, blown fuses, warm wall plates or extension cords, and tripped circuit breakers.</li> <li>• Contact Physical Plant Electricians if you need assistance with electrical hazards.</li> <li>• Avoid working in these areas if you have cardiac pacemakers or metallic implants.</li> <li>• Get approval from laboratory personnel before bringing any steel (e.g., tools, gas cylinders, etc.) into the laboratory.</li> </ul>
	<ul style="list-style-type: none"> <li>• Strong radio waves can interfere with the operation of electronic equipment.</li> </ul>

## Protective Clothing and Equipment

### Minimum clothing

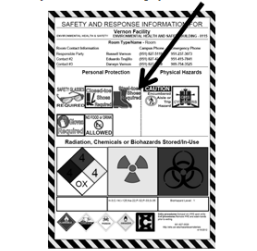
The minimum personal protective equipment (PPE) required to enter a laboratory is:

	• Eye protection (e.g. safety glasses, safety goggles, etc.)
	• Body covering that is long (e.g. long pants, long-sleeved shirt or coat)
	• Hand protection (wearing rubber gloves in the laboratory (e.g. gloves))
	• Closed-toe shoes (e.g. tennis shoes, boots, etc.)

Clothing that is not acceptable includes short, skirts, t-shirts, vests, tank tops, sandals, flip-flops or slippers, mittens, fingerless gloves, or open gloves. These do not provide adequate protection in case of chemical splash or spill. Wear gloves, safety eyewear, and body coverage if you are working in a bench area, in an area where chemicals were stored, or on laboratory equipment.

### Additional clothing

You may be required to wear additional clothing, depending on the laboratory you are entering. This clothing will often be identified on a door placard. In the example below, the additional clothing required is "Steel-toe" shoes.



You may be also be asked to wear "clean areas" where animals or equipment are highly susceptible to everyday germs, dirt, etc. In these areas you will be asked to wear coveralls, gloves, masks, and other protective gear intended to protect the research from possible contamination from you.

## Work Practices

### Attitude, awareness, and responsibility

In particular, be aware of the equipment. You should stop away from contaminated equipment in the laboratory. You can always tell if someone personnel may not always be sure you are aware of a supervisor.

### Custodial Staff Best Practice

Generally the following best practice routine entry into campus lab:

- **Trash**  
Hazardous waste containers (indicative name) will be EH&S (951) 827-5221
- **Spills**  
Staff will not touch or clean floor, but instead will report.
- **Restricted areas**  
For labs that are posted as "Personnel Only" (such as in the example below), the additional clothing required is "Steel-toe" shoes for routine access.

### Fume hoods or Rooms

Fume hoods are the most common type of laboratory equipment used to protect researchers and reduce exposure. The use of fume hoods in the laboratory is a critical part of laboratory safety. Fume hoods are used to contain and remove hazardous vapors, gases, and dusts from the laboratory.

Always consider the inside of fume hoods to be chemically contaminated. Unless you see an equipment clearance sign, do not proceed until communicating with EH&S. Some hidden hazards may go undiscovered until renovations are underway. These may include finding broken glass, needles, or small amounts of mercury metal in drain traps. Sometimes the inside of a fume hood should always be considered to have some contamination. Note that mercury must be given to EH&S for proper disposal. Contact laboratory personnel for any hazards that might be discovered during the course of work and wait for instructions.

Equipment Clearance Sign (Refrigerator Sample)

This refrigeration equipment has been surveyed for obvious chemical and biohazardous contamination. No apparent extraordinary hazards were identified.

As with all refrigerators, this may contain common household, food, nutrients or other generally non-hazardous residues. This equipment can be handled as any domestic type equipment, using common precautions.

Inspected by: \_\_\_\_\_ Date: \_\_\_\_\_

Inspected by: \_\_\_\_\_ Date: \_\_\_\_\_

Inspected by: \_\_\_\_\_ Date: \_\_\_\_\_

Inspected by: \_\_\_\_\_ Date: \_\_\_\_\_



## Emergencies

### Know how to use emergency equipment

One of the first things you should do when entering a laboratory is to identify the location of the nearest emergency exit (for the laboratory and building) and locate the emergency equipment. The following is common equipment you will find, and how to use it:

Fire Extinguisher	Safety Shower
<ol style="list-style-type: none"> <li>1. Pull the handle to turn on.</li> <li>2. Aim.</li> <li>3. Squeeze.</li> <li>4. Sweep.</li> </ol>	<ol style="list-style-type: none"> <li>1. Pull the handle to turn on.</li> <li>2. Wash for 15 min.</li> <li>3. Release handle to stop.</li> <li>4. Remove affected clothing.</li> </ol>
Eye Wash	Emergency Medical
<ol style="list-style-type: none"> <li>1. Pull the handle (down).</li> <li>2. Evacuate building.</li> </ol>	<ol style="list-style-type: none"> <li>1. Put face and eyes in proper location.</li> <li>2. Turn the lever on.</li> <li>3. Wash open eyes for 15 min.</li> <li>4. Turn the lever off.</li> </ol>

### What should you do if an emergency occurs?

1. **Protect yourself**
  - Notify others
  - Most buildings have fire alarms and pull stations.
  - Use a fire extinguisher if trained.
  - In case of a small fire in your area, use a fire extinguisher (if you have been trained to do so) and if the fire is small enough, you are not sure you are not endangering yourself. These are located near the exit door of most laboratories.
  - Evacuate
  - If you hear an alarm in your area, work, and turn off equipment. Evacuate the building and wait for authorization from the responsible authorities.
  - Evacuate
  - Remember to close the door behind you as you leave.
2. **Notify others**
  - Inform others in the immediate area who so they can evacuate. Notify your supervisor. Call EH&S (951) 827-5221 or 911. You can also call the Principal Investigator/Supervisor on the door placard. Wait for emergency personnel in a safe area away from the spill.
3. **Get help**
  - If you or someone working with you is in a laboratory injured, follow the procedures for what to do "in case of an accident." For serious injuries call 911.
4. **Seek medical attention**
  - If chemicals are spilled in the eyes or on the skin, immediately rinse the affected area with water for 15 minutes. Over-the-counter and safety gloves are available in most laboratories or in hallways.
5. **Report**
  - Notify your supervisor immediately, even if it is a minor injury. This will help prevent it from happening to someone else. Make sure to complete an Incident and Investigation Report.



## Multiple Choice

including True or False

**How smart is Janette?**

- A. Very smart
- B. Smart
- C. Neutral
- D. Not smart
- E. Not smart at all

## Fill in the blank

**Janette \_\_\_\_\_ has a degree in \_\_\_\_\_, and works for the University of \_\_\_\_\_.**

## Essay

**Describe Janette**  
(5 paragraphs)

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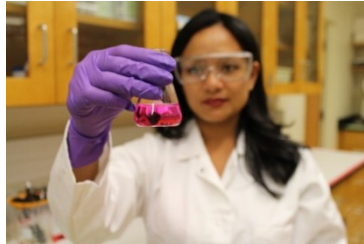
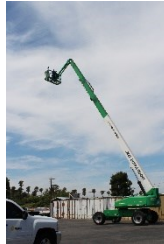
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## Observation





## Multiple Choice

including True or False

- Easy to score
- Can cover lots of content
- Measures memorization
- Allows guessing

## Fill in the blank

- Easy to score
- Limits guessing
- Harder to score
- Numerous answers may work

## Essay

- Measures knowledge
- Difficult to score

## Observation

- Better evidence of skills
- Engaging for students
- Difficult to develop checklists
- Time consuming to score