BASIC SCIENCE LAB PROCEDURES[1]

NAME _____SCHOOL _____

DATE STARTED_____DATE COMPLETED_____

PREREQUISITE: Knowledge of metric system.

HOW TO DO THIS COURSE: Do the steps one at a time, in order. When you finish a step, put your initials and the date on the sign-off line on the right. A split line means to get a pass (and an initial) from another student (or the Lab Supervisor if it says that). A * means get a checkout. Essays are turned in to the Academic Supervisor. Note: students who check out drills need to have first passed those drills themselves.

PURPOSE: Learn how to work carefully and safely in a laboratory where chemical procedures are performed.

ESTIMATED TIME: 5 hours.

MATERIALS NEEDED FOR THIS COURSE

Study booklet, *Basic Science Lab Procedures*, with these data sheets (DS):
8160 8161 8162 8163 8164 8165 8166
Exam: 8167, 8168 (answers)

Other materials:
DVD: *Introduction to Laboratory Safety—Chemistry/Physics*, Flinn Scientific
DVD player; lab locator system created for the school's science lab; chemistry laboratory with basic equipment (see specific activities in study guide), several pieces of ¼-inch glass tubing cut to 8-inch lengths.

A. LAB SAFETY

1. READ: DS #8160 Safety in the Science Lab. _____

2. DVD: *Introduction to Laboratory Safety—Chemistry/Physics*.
   a) Review DS #8161 Glossary for DVD: *Introduction to Laboratory Safety—Chemistry/Physics* and make sure you understand any definitions you are not sure of. ___
   b) Watch the DVD. It is 16 minutes long. ___ _____

3. READ: DS #8162 Science Lab Safety: How to Dress and What to Do in the Science Lab, to heading "Chemical Storage." _____

4. DEMONSTRATE: Using DS #8162, demonstrate each of the rules to a coach in the science lab. ____ ____

[1] A **procedure** is a group of steps that must be done correctly and in the right order to get the desired result.

5. READ: DS #8162, section “Chemical Storage.” _____

6. PRACTICAL APPLICATION: Citric acid (from citrus fruit) and baking soda are both white powders with many uses in the home. Sometimes the containers are stored together on a shelf. This demonstration shows what might happen if they spill together and get wet.

   a) Pour one tablespoon of baking soda into a small beaker. ___

   b) Add one tablespoon of citric acid. ___

   c) Fill the beaker with water and watch what happens. ___

      Results: In the presence of water, baking soda and citric acid react, spewing foam over the table. (The gas bubbles in the foam are carbon dioxide released from the baking soda.)

      This shows that to prevent accidents, chemicals that can react shouldn’t be stored next to each other.

   d) Rinse out the beaker and put it away. ___

   e) Clean up the spill with paper towels or a sponge. Rinse the chemicals down the sink. ___ _____

7. PRACTICAL APPLICATION: Learn the chemical storage system used in your science lab so that you will be able to use it to find chemicals in the future. _____

8. READ: A **lab locator system** is something that shows where things are in the science lab so that you can find them easily without having to ask the Lab Supervisor each time. It can be in the form of a list, a chart or map, or something else that helps you find things. _____

9. PRACTICAL APPLICATION: Find what sort of lab locator system is in use in your science lab, where it is and how to use it. Use the lab locator to find at least ten items. _____

10. READ: DS #8163 Science Lab Safety: Doing Experiments, section “Working on Experiments.” _____

11. DEMONSTRATE: Using DS #8163, demonstrate each of the rules from section “Working on Experiments” to a coach in the science lab. ____ ____

12. READ: DS #8163, sections “Working with Electricity” and “Other Lab Safety Points.” _____

13. DEMONSTRATE: Using DS #8163, demonstrate each of the rules from sections “Working with Electricity” and “Other Lab Safety Points” to a coach in the science lab. ____ ____

B. HANDLING ACCIDENTS IN THE SCIENCE LAB

1. READ: DS #8164 Science Lab Safety: Handling Accidents in the Lab, to heading "Water and Chemical Spills." _____
2. DRILL: In the science lab, clean up a piece of broken glassware properly. Pass by a student who has previously done the drill. ____ ____
3. READ: DS #8164, section "Water and Chemical Spills." _____
4. DRILL: Find out the procedures used in your science lab for cleaning up chemical spills. Then create a small spill of salt or baking soda and use the procedure to clean it up. _____
5. READ: DS #8164, section "Chemicals in the Eye." _____
6. DRILL: Carry out the procedure for a chemical in the eye. As part of this drill, flush your eye with water from the eyewash station for at least one minute instead of the full 15–20 minutes.[2] ____ ____
7. READ: DS #8164, section "Other Procedures to Know," to end of data sheet. _____
8. DRILL: Learn the procedure for burns used in your science lab and practice it until you can do it. _____
9. DRILL: Learn the procedure for cuts used in your science lab and practice it until you can do it. _____
10. DRILL: Learn the procedure for handling fires on the chemistry bench used in your science lab and practice it until you can do it. The Lab Supervisor will set a fire using a small amount of alcohol or another flammable liquid. **Lab Supervisor pass.** ____ ____

C. SOME BASIC SCIENCE LAB PROCEDURES

1. READ: DS #8165 Some Basic Science Lab Procedures, section "Gas Burners." _____
2. DEMONSTRATE: Go to the science lab and find out which kind of gas is used and which kinds of burners are used. _____
3. READ: DS #8165, section "Lighting a Gas (Bunsen or Meker) Burner" to subheading "Heating a Glass Beaker." _____

[2] If you wear contact lenses, close your eye(s) while doing this drill. If a chemical actually splashed in your eye while wearing contacts, you would do the extra steps discussed in the data sheet.

4. DRILL: Do this with a coach. Practice lighting a gas burner until you can do it correctly. ____ ____

5. DRILL: Do this with a coach. Fill a test tube 1/3 full of water, and practice heating it smoothly to a boil over a burner. ____ ____

6. READ: DS #8165, subsection "Heating a Glass Beaker" to end of data sheet. _____

7. DRILL: Use the procedure "Heating a Liquid in a Beaker over a Flame" to boil about 50 ml of water in a 200 ml beaker. **Lab Supervisor pass** on how you set up the apparatus. ____ ____

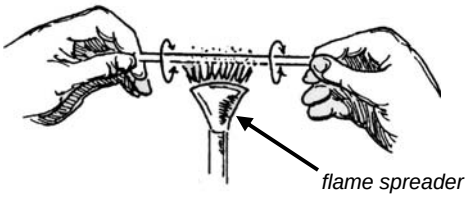
8. DRILL: In this drill, you will be bending glass tubing. Read through these instructions before you begin and practice lab safety at all times:

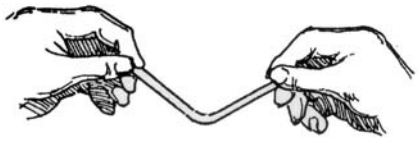
   a) Get several pieces of ¼-inch diameter glass tubing that are about eight inches long. ___

   b) Place a flame spreader (wing tip) on the nozzle of a Bunsen burner. (If you don't have a flame spreader, a Meker burner can be used without a flame spreader.) ___

   c) Light the flame and adjust it so that the flame spreads out along the width of the flame spreader. ___

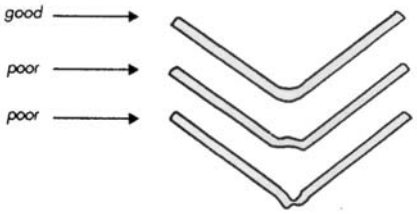
   d) Choose a piece of glass tubing and hold the ends with the middle in the hottest part of the flame. Rotate the tubing so that it heats evenly. (See illustration to right.) When the glass begins to melt from heat, the glass will begin to glow yellow and soften. ___





   e) As soon as the glass softens a bit, remove the tubing from the flame and *quickly* bend the two ends into a right angle with a steady motion. (After you remove the tubing from the flame, you'll have less than five seconds to bend the glass before it solidifies too much to bend.)

      The tubing won't bend right if the glass isn't soft enough when you make the bend or if you bend it too fast. If you heat the glass tubing too long before doing step e), it will sag and melt. ___



illustrations courtesy of the National Science Teacher's Association

   f) After you have completed the bend, place the glass tubing to cool on a ceramic plate, wire gauze or other insulator. Put a HOT sign

next to it. It takes about three minutes for the glass to cool enough to touch the heated part. ___

g) Repeat the steps above until you can make a good bend. ____ ____

*9. READ: DS #8166 Weighing with a Balance, to heading "Measuring Weights and Masses with a Laboratory Balance." ____ ____

10. DEMONSTRATE: Show the difference between mass and weight. ____ ____

11. READ: DS #8166, section "Measuring Weights and Masses with a Laboratory Balance," to heading "Drill for Measuring Mass with a Triple-Beam Balance." _____

12. DEMONSTRATION: A common type of triple-beam balance was shown in DS #8166, but there are other models in use. Go to the science lab and see which model(s) the lab has and compare it to the illustration in the data sheet. Then find the following parts on any triple-beam balance available:

    the pan ___ the riders ___ the zero point ___

    three beams ___ the pointer ___ _____

13. DRILL: Review Part A of the Drill for Measuring Mass with a Triple-Beam Balance in DS #8166, and then do the drill. ____ ____

14. DRILL: Review Part B of the Drill for Measuring Mass with a Triple-Beam Balance in DS #8166, and then do the drill. ____ ____

15. DRILL: Review Part C of the Drill for Measuring Mass with a Triple-Beam Balance in DS #8166, and then do the drill. ____ ____

D. FINAL APPLICATION SECTION

1. DVD: Watch the DVD *Introduction to Laboratory Safety—Chemistry/ Physics* again for review. _____

2. PRACTICAL APPLICATION: Ask your Lab Supervisor for any additional safety data that is specifically relevant to your school, and do anything needed to learn it. _____

3. PRACTICAL APPLICATION: Go back to the science lab while some other students are working at the chemistry bench and make a rapid check to see if the lab safety rules are being followed. (You won't be able to see every rule in use, of course. For instance, there is a rule about how to hold a test tube, but if no one is using a test tube at the time, you wouldn't check that item.) Report anything that needs correction to the Lab Supervisor immediately.

You can refer to these references if you need to:

DS #8162 Science Lab Safety: How to Dress and What to Do in the Science Lab

DS #8163 Science Lab Safety: Doing Experiments

DS #8164 Science Lab Safety: Handling Accidents in the Lab

DVD *Introduction to Laboratory Safety—Chemistry/Physics*

Any additional lab safety data from the Lab Supervisor

Lab Supervisor pass. ____ ____

I have completed the steps of this course. I understand what I studied and can use it.

Student _____ Date _____

The student has completed the steps of this course and knows and can apply what was studied.

Academic Supervisor _____ Date _____

The student has passed the exam for this course.

Examiner _____ Date _____