LAB SAFETY

Introduction

Chemistry is exciting! Each day in the laboratory you are given the opportunity to confront the unknown, and to understand it. Each experiment holds many secrets. Look hard and you may see them. Work hard and you can solve them.

The word *science* comes from the Latin word *scire*, which means “to know.” The goal of science is knowledge. Scientists are men and women who devote their lives to the pursuit of knowledge. In this class, you are given the opportunity to do what scientists do. You can wonder how things work, ask why and how, and then think of ways to answer our own questions. You are given the chance to understand what is unknown to you and to many other people.

It is a great opportunity. Do not waste it by being lazy or careless. Work hard. Master the scientist’s skills of observation and experiment. These skills are tools to solve the secrets of the unknown.

Safety

Chemistry is a laboratory science. As part of your laboratory experience you will handle many chemical substances and manipulate specialized laboratory equipment. Many of these substances pose a health risk if handled improperly, while some of the laboratory equipment can cause sever injury if used improperly. This is a guide to the safe laboratory practices you will use throughout this course.

Preparation and Safety

To get the most out of your laboratory experience, you must be well prepared for each experiment. This means that you must read the experiment thoroughly before coming to the laboratory. Make sure you have a clear idea of what the experiment is about. Be sure that you understand each step of the procedure. If you are unsure of any part of the experiment, ask your teacher for help before you begin.

Preparation is important not only to understanding, but also to safety. If you are well prepared for the laboratory, it is much less likely that an accident will occur. In the lab, you are responsible not only for your safety, but also for the safety of your classmates. If an accident happens because you are not prepared, it can also affect your friends. This is all the more reason for you to take the time and make the effort to prepare yourself for the laboratory.

Be sure to note the safety warnings listed in the *Safety* section of each experiment. Note that these warnings are emphasized by symbols. The symbols mark those parts of the procedure that may be hazardous. In addition, be sure to observe the general safety precautions described in the *Lab Safety* section of your notes. Finally, remember the most important safety advice of all: *Always wear safety goggles in the chemistry laboratory!*

Laboratory Hazards

You should be aware of possible hazards in the laboratory and take the appropriate safety precautions. By doing so, the risks of doing chemistry can be minimized. This safety handout is intended to acquaint you with the hazards that exist in the laboratory and to indicate how you can avoid these hazards. In addition, information is provided on what to do if an accident should occur.

Thermal Burns

A thermal burn can occur if you touch hot equipment or come too close to an open flame. You can prevent thermal burns by being aware that hot and cold equipment look the same. If a gas burner or hot plate has been used, some of the equipment nearby may be hot. Hold your hand near an item to feel for heat BEFORE touching it. Treat a thermal burn by immediately applying cool running water to the burned area. Continue applying the cool water until the pain is reduced. This usually takes several minutes. In addition to reducing pain, cooling the burned area also serves to speed the healing process. Greases and oils should not be used to treat burns, because they tend to trap heat. Medical assistance should be sought for any serious burn. *Notify your teacher immediately if you are burned.*

Chemical Burns

A chemical burn occurs when the skin or a mucous membrane is damaged by contact with a substance. The *Materials* section of each exercise indicates which substances can cause chemical burns. “C” stands for corrosive. It indicates that the chemical can cause severe burns. “I” stands for irritant. It indicates that a chemical can irritate the skin and the membranes of the eye, nose, throat, and lungs. Chemicals that are marked “C” and “I” should be treated with special care. Chemical burns can be severe. Permanent damage to mucous membranes can occur despite the best efforts to rinse a chemical from the affected area.

The best defense against chemical burns is prevention. Without exception, wear safety goggles during all phases of the laboratory period – even during cleanup! Should any chemical splash in your eye, immediately use a continuous flow of running water to flush your eye for a period of 15 to 20 minutes. Call for help. Contact lenses should not be worn in the laboratory. If the chemical is an acid or base, the contact lens can cause the chemical to concentrate under the lens and cause extensive damage. Estimates for time required for permanent corneal damage to occur following exposure to 1M NaOH are in the range of 30 seconds. Wear a lab apron (If available) and close-toed shoes to protect other areas of your body. If corrosive chemicals should contact your exposed skin, wash the affected area with water for several minutes.

An additional burn hazard exists when concentrated acids or bases are mixed with water. The heat released in mixing these chemicals with water can cause the mixture to boil, spattering corrosive chemical. The heat can also cause non-Pyrex containers to break, spilling corrosive chemical. To avoid these hazards, follow these instructions: *Always add acid or base to water, very slowly and stirring; never the reverse.* Concentrated sulfuric acid causes thermal burns because it reacts with the water in the skin, releasing substantial amounts of heat. Nitric acid does not produce thermal burns, but reacts with the proteins in the skin, destroying tissue. Nitric acid burns are very slow to heal.

Cuts from Glass

Cuts occur most often when thermometers or pieces of glass tubing are forced into rubber stoppers. Prevent cuts by using the correct technique for this procedure. The hole should be lubricated with glycerol or water to facilitate the movement of the glass tubing. Glycerol should never be used in the presence of powerful oxidizers such as sulfuric acid, nitric acids, dichromates or permanganates. The glass should not be gripped directly with the hands, but rather by the means of paper towels. The towels will protect the hands if the glass should break. Use a gentle twisting motion to move the tube smoothly into the stopper.

Avoid cuts from other sources by discarding chipped and cracked glassware according to your teacher's instructions. If you should receive a minor cut, allow it to bleed for a short time. Wash the injured area under cold running water and notify your teacher. Serious cuts and deep puncture woods require immediate medical help. Notify your teacher immediately. While waiting for assistance, control the bleeding by applying pressure with the fingertips or by firmly pressing with a clean towel or gauze.

Fire

A fire may occur if chemicals are mixed improperly or if flammable materials come too close to a burner flame or hot plate. When using lab equipment, prevent fires by tying back long hair and loose-fitting clothing. Do not use a burner when flammable chemicals are present. These chemicals are designated with the symbol "F" or with a picture of a flame in the material section of each exercise. Use a hot plate as a heat source instead of a burner when flammable chemicals are present.

If hair or clothing should catch fire, DO NOT RUN, because running fuels a fire. Drop to the floor and roll slowly to smother the flames. Shout for help. If another person is the victim, get a fire blanket to smother the flames. If a shower is nearby, help the victim to use it.

In case of a fire on a laboratory bench, turn off all accessible gas outlets and unplug all accessible appliances. A fire in a container may be put out by covering the container with a nonflammable object. It could also be smothered by covering the burning object with a damp cloth. If not, call for a fire extinguisher. Spray the base of the fire with foam from the extinguisher. ***Caution:*** *Never direct the jet of a fire extinguisher into a person's face.* Use a fire blanket instead. If a fire is not extinguished quickly, leave the laboratory. Crawl to the door if necessary to avoid smoke.

Carbon dioxide fire extinguishers have the advantage of being very effective in fires involving flammable liquids or electricity. However, carbon dioxide extinguishers are not useful in fires involving wood or embers. Carbon dioxide does have the advantage of not leaving any residue should discharge occur. ABC fire extinguishers discharge a powder which is effective on all fires except those involving metals. ABC extinguishers do leave a residue which must be removed. Always aim the extinguisher at the base of the fire.

When using a fire extinguisher always remember the acronym PASS:

P: Pull the pin

A: Aim at the base of the fire

S: Squeeze the handle

S: Sweep back and forth at the base of the fire

Poisoning

Many of the chemicals used in the experiments in class are toxic. You should do several things to prevent poisoning. Never eat, chew gum, or drink in the lab. Do not touch chemicals. Clean up spills. Keep your hands away from your face. In this way, you will prevent chemicals from reaching your hands, mouth, nose, or eyes.

In some cases, the detection of odor is used to indicate that a chemical reaction has taken place. It is important to note, however, that many gases are toxic when inhaled. If you must detect an odor, use your hand to waft some of the gas toward your nose. Sniff the gas instead of taking a deep breath. This will minimize the amount of gas sampled.

Situation	Safe Response
Burns	Immediately flush with cool water until the burning sensation subsides
Fainting	Provide fresh air (for instance, open a window). Move the person so that the head is lower than the rest of the body. If breathing stops, use artificial resuscitation.
Fire	Turn of all gas outlets. Unplug all appliances. Use a fire blanket or fire extinguisher to smother the fire. CAUTION: Do not cut off a person's air supply.
Eye injury	Immediately flush the eye with running water. Do not allow the eye to be rubbed if a foreign object is present in the eye. Make sure all contact lenses are removed.
Minor Cuts	Allow to bleed briefly. Wash with soap and water.
Poisoning	Note what substance was responsible.
Spills on skin	Flush with water

*****Remember that the teacher should be notified immediately in all cases. The nurse should be notified in all emergencies.*****