

Protocol Writing

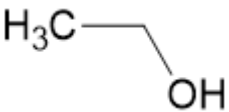
For Research 2, AY 2021-22

In general: This is project-dependent. The length and amount of information will depend on the type of project (e.g. experimental, technical, observational, etc). As a rule of thumb, a protocol has to be prepared before you can use the laboratory for your project implementation. It is a detailed version of your methodology, where ideally a third-party validation can be done and can do your procedures if they have this document.

Required Contents

1. List of materials (consumable and non-consumable) and equipment. Indicate the estimated amount/quantity needed and other pertinent details (e.g., size/capacity for glassware)
2. [FOR PROJECTS INVOLVING CHEMICALS ONLY] List of reagents and expected products, including their corresponding structure, molecular weight, physical and chemical properties (i.e. appearance, melting point, boiling point, density, solubility), hazards and safety precautions/handling, and accidental contact/release measures. Consult the safety data sheet (SDS) available online. See Table 1 below for an example.
3. [FOR PROJECTS INVOLVING MACHINIST TOOLS/EQUIPMENT] List of tools and equipment, including their corresponding hazards, and required safety precautions/handling and their disposal/cleanup procedures (if applicable). See Table 2 below for an example.
4. [FOR PROJECTS INVOLVING USE OF BIOLOGICAL SPECIMENS] List equipment, including their corresponding hazards, and required safety precautions/handling, and their disposal/cleanup procedures. See Table 3 below for an example.
5. **Step by step procedures** specifying the amount and concentration (for mixtures) of substances to be used. This could be in the form of a flowchart, numbered list, etc. Include figures/schematic diagrams if necessary. Do not forget to cite the basis for the procedures. Imagine a pre-lab for a lab experiment.
Note: Use of some equipment/special procedures may require a separate protocol (e.g., Soxhlet extraction, Kirby-Bauer method, etc.).
6. [FOR PROJECTS INVOLVING SIMULATION/COMPUTER SOFTWARE] Include needed functions and operations to execute (i.e. what tools in Fusion 360 / ANSYS), or any specific coding approaches that you plan to do. In short, have your adviser approve your design and/or fabrication plan.
7. [FOR PROTOCOLS INVOLVING CHEMICALS ONLY] Waste disposal/decontamination procedures. For chemicals requiring special disposal/decontamination measures, include the EMB Waste Classification Number.

Table 1. List of Reagents and Expected Products

Substance	Physical/Chemical Properties	Hazards, Safety Precautions and Handling	Measures in case of Accidental Contact or Release (spillage)
<p>List the common and IUPAC names with its corresponding chemical structure</p> <p><i>Include reagents and expected products</i></p>	<p>Indicate notable physical and chemical properties (e.g., boiling and melting points, solubility, appearance, etc.)</p>	<p>Indicate the GHS class, hazards (e.g., corrosive, reacts with water, toxic, etc.) and the required safety precautions/handling required (e.g., wear nitrile gloves, work under fume hood, etc.)</p>	<p>Indicate the first aid measures upon accidental contact (e.g., rinse with water, etc.) or release (e.g., turn off all open flames, etc.)</p>
<p>Ethanol C₂H₆O</p> 	<p>Clear, colorless liquid Boiling point: 78.29 °C at 1.013 hPa Flash point: 13 °C Autoignition temperature: 455 °C at 1.013 hPa</p>	<p>GHS Class: Flammable liquids (Category 2), H225 Eye irritation (Category 2), H319</p> <p>Hazards: Highly flammable liquid and vapor. Causes serious eye irritation.</p> <p>Precautions: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep the container tightly closed. Ground and bond container and receiving equipment. Use explosion-proof electrical/ ventilating/ lighting/ equipment. Use non-sparking tools.</p>	<p>First Aid Measures: After inhalation: fresh air. In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. In case of eye contact: rinse out with plenty of water. Call an ophthalmologist. Remove contact lenses. If swallowed: immediately make the victim drink water (two glasses at most). Consult a physician.</p> <p>Suitable extinguishing media: Water Foam Carbon dioxide (CO₂) Dry powder</p> <p>Accidental release measures: Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe</p>

			emergency procedures, consult an expert. Do not let the product enter drains. Risk of explosion
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Table 2. List of Tools/Equipment for Fabrication

- In general, include all safety precautions as specified in your particular tool's handling. The table below lists some common hazards and suggested safety procedures.

Protocol / Instrument Usage	Possible Hazards	Safety procedures, handling, and disposal
Soldering: use of soldering iron and lead when fabricating circuits in a PCB instead of a breadboard	High temperature (up to 400 degrees C)	<p>Proper handling of instruments (hold only on handle and never touch the metal rod). Place the soldering rod on a stand when not in use.</p> <p>Have a moist sponge nearby to wipe the soldering tip after every application/melting</p> <p>If available, use a "third arm" attachment to assist in clamping electronic components and the board to solder.</p> <p>Avoid inhaling solder fumes. Wear face masks if available. Safety goggles provide additional protection.</p> <p>In case of solder burn, treat with cool running water for 5-15 minutes, and do not use ice.</p> <p>Apply burn ointment afterwards, and cover with bandage.</p>
PCB Etching	Ferric chloride etching solution is toxic; may cause eye irritation	Wear face masks and/or safety goggles in case of splash

	<p>Etchant stains (not really hazardous but are practically impossible to remove from clothes)</p>	<p>While Ferric Chloride is less harmful compared to other chemical etchants, prolonged contact with skin is undesirable</p> <p>Spills may be cleaned with disposable rags, but baking soda or cat litter are also useful for soaking up spills</p>
<p>Use of power tools / woodwork / metalwork</p>	<p>Sharp edges; high-rotation activities may result in bodily injury</p>	<p>For corded tools, make sure that the line is safely placed and will not interfere with normal work</p> <p>Keep hands and other body parts free from the tool's edge (e.g. drill bit, saw, sharp edge)</p> <p>For woodwork/metalwork - safety goggles should be worn as protection against debris</p> <p>Always check integrity of the tools being used as this may not only cause damage but result in inefficient fabrication</p>
<p>3D printing (if with personal printer)</p>	<p>High bed (80 - 100 C) and nozzle (up to 250 C) temperatures</p>	<p>Application of adhesion (e.g. masking tape) on the bed may be used</p> <p>Steer clear of the printing area once printing has started</p> <p>Ensure that printing is steady and previous layers are still adhered to the bed as sliced; monitor the infeed of the 3d printing filament to ensure that printing is continuous</p> <p>Do not directly touch the nozzle or the bed during operation. Wait for the operation to finish cooling before removing the printed</p>

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Table 3. List of Possible Hazards and Safety Procedures and Disposal of Biological Specimens

Protocol / Instrument Usage	Possible Hazards	Safety procedures, handling, and disposal
Handling of microbial cultures (e.g. specify your bacteria)	Universal precautions should be applied – consider all microbiological specimens to be potentially pathogenic	<p>Wear lab gown/coat, face masks, gloves</p> <p>Use biosafety cabinet and follow biosafety level practices; open microbial culture inside a biosafety cabinet only</p> <p>Practice proper aseptic techniques at all times</p> <p>All materials/lab tools and non-disposable lab gowns/coats must be properly disinfected and cleaned</p> <p>Plastic petri dishes, plastic pipettes, microscope slides, and swabs are considered disposable; these must be sterilized and discarded. All of these disposable contaminated materials should be placed in the designated waste container containing a biohazard autoclave bag.</p> <p>Face masks and gloves must be disposed of in the biohazard garbage</p> <p>Decontaminate (autoclave) disposable lab gowns/coats and microbiological samples prior to disposal</p>
Use of biological samples: a. Blood and other bodily fluids	Potentially infectious	<p>Wear lab gown/coat, face masks, gloves, eye protection</p> <p>All materials/lab tools and non-disposable lab gowns/coats must be properly disinfected and cleaned</p>

<p>b. Animal specimens (the use of animal specimens require that the Animal Use Protocol has been approved by the IACUC; collection of animals from the wild must adhere to Philippine laws)</p>	<p>Potentially disease/parasite carriers</p>	<p>Sharps (blades and needles) must be disposed of in a biohazard container</p> <p>All disposable PPE (face masks and gloves) must be disposed of in the biohazard or clinical waste garbage</p> <p>Wear lab gown/coat, face masks, gloves, eye protection</p> <p>All materials/lab tools and non-disposable lab gowns/coats must be properly disinfected and cleaned</p> <p>Non-hazardous waste must be placed into black trash bags that are a minimum of 3 mm thick (under IACUC approved guidelines)</p> <p>Biohazardous waste must be placed in biohazard bags and autoclaved, afterwhich the bag should be placed into regular trash</p> <p>Animal tissues/carcasses treated with chemicals should be stored in plastic bags in a designated freezer</p>
<p>c. Plant specimens (collection of plants from the wild must adhere to Philippine laws)</p>	<p>May potentially contain allergens or toxic substances</p>	<p>Wear lab gown/coat, face masks, gloves</p> <p>Non-hazardous waste must be placed in trash bags and the bags should be disposed of into regular trash</p>