



GREEN LABS AT EMORY GUIDANCE DOCUMENT

#	Item Description	Suggested Action	Justification
1.0	ENERGY AND WATER EFFICIENCY AND CONSERVATION		
	In our lab, we . . .		
1.1	Turn off equipment when it is not in use.	If necessary, utilize signage to enforce this practice. You may request equipment reminder clings from the Green Lab Team .	The energy used by lab “plug-in” equipment constitutes 10 to 50 percent of the total lab energy use (IS2L- Energy-Efficient Laboratory Equipment Wiki).
1.2	Unplug lab equipment daily when it is not in use to reduce “vampire” loads.	If necessary, utilize signage to enforce this practice. You may request equipment reminder clings from the Green Lab Team .	A vampire load is the amount of energy an appliance uses while in “standby” mode or while switched “off” and still plugged in (EfficiencyVermont).
1.3	Keep cooling equipment full for maximum energy efficiency (freezers, dry ice coolers, etc.).	Notify other labs when freezer space is available. If there are no additional materials to place in freezers, reused ice packs can reduce empty space.	A full freezer stays colder longer; it takes less energy to keep frozen items cold than to cool the air of empty space in a freezer (eHow).
1.4	Inventory our freezer contents to minimize the time the door is open while accessing materials.	Labs may designate this responsibility to a particular lab member and post an inventory listing on the exterior of freezers with the location of specific items (see Appendix A for sample freezer inventory).	Every time a freezer is opened it requires extra energy to bring the temperature back down again, and the longer it is left open the more cold air is lost.
1.5	Unplug empty freezers when not in use.	Communicate with other labs to consolidate or share freezer space so that an empty or near empty freezer can be unplugged.	One -80°C freezer uses as much energy as a single family home each year (IS2L- CDC Cold Storage Efficiency).

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1.6	Defrost our freezers regularly for maximum energy efficiency.	Refrigerators and freezers should be cleaned out and defrosted annually, and a record of defrost dates should be maintained.	Defrosting is necessary because the buildup of ice prevents heat from transferring out of refrigerators and freezers and increases running costs (UVM- Green Laboratories: Energy Savings and Sustainability).
1.7	Place freezers in freezer farms.	Contact appropriate personnel in lab building to have freezers transferred to freezer farms, if applicable.	Ultra-low freezers use a lot of energy and emit a lot of heat; putting them in a freezer farm makes them easier to monitor and regulate (UCSD- The Green Triton).
1.8	Store at -80°C only those samples that need to be at that temperature.	If your lab has an -80 ULT freezer but none of the samples require this storage temperature, turn the settings to the highest possible temperature for the samples that are present.	One -80°C freezer uses as much energy as a single family home each year (IS2L- CDC Cold Storage Efficiency).
1.9	Maintain equipment according to manufacturer instructions to optimize performance and efficiency.	Labs may determine maintenance schedules based on their specific equipment. A clear and accessible record should be maintained.	Following manufacturer recommendations will increase the lifespan of the equipment, prevent delays and inaccuracies in results, and ensure that equipment performs at maximum efficiency.
1.10	Use cleaning equipment only when full (dishwashers, autoclaves, etc.).	Labs may create a schedule for washing, autoclaving, and other cleaning duties and designate a lab member to ensure the schedule is followed.	Dishwashers and autoclaves use the same amount of water and energy whether they are empty or full, so waiting until they are full conserves these resources (Thermodynamic Realities of Medical-Grade Autoclaves).
1.11	Turn lights of when not in use, including task lighting.	Take advantage of natural lighting whenever possible; turn off ambient lighting when task lighting is sufficient, and if necessary, utilize signage to remind lab members to turn off lights. Light switch clings can be requested from the Green Lab Team . Note: Laboratories in Claudia Nance Rollins, 1462 Clifton Road, Rollins Research Center, and the Math / Science building must leave their room lights on when using the fume hood. Fume hoods in these buildings are set back when lights are off.	Lighting energy intensity in labs is up to twice that of a typical office space and accounts for 8% to 25% of total electricity use (I2SL- Best Practice Guide).

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1.12	Report any water leaks in pipes or sinks to Facilities Management.	Place signage above sinks with Facilities Management contact information. To request signage, contact the Green Labs Team .	A tap leaking at the rate of 1 drop per second will waste almost 20,000 liters of water per year (Aquatrip- The Real Cost of Water Wastage).
1.13	Use water aspirators minimally.	Use vacuum systems in lieu of water aspirators.	A single water aspirator can consume and contaminate as much as 100 gallons of water in an hour (knufa).
1.14	Lower the sash on the fume hood when not in use.	Educate lab members on how to properly use the fume hood and apply a reminder sticker to reduce the energy burden that fume hoods place on facility HVAC systems. Contact your EHSO building liaison if your chemical fume hood does not have a “lower your sash” sticker.	Keeping a fume hood open when not in use can waste \$1,500 per year in energy costs (National Institute of Building Sciences).
1.15	Post signage encouraging energy savings throughout the laboratory.	Request energy-savings signage from the Green Labs Team .	Signs (ex: stickers over light switches) serve as visual cues to remind us to incorporate energy saving behaviors in our day-to-day lives.
1.16	With the consent of EHSO, set the rate of air change at 8 changes per hour, versus the common 10 changes per hour.	Contact your EHSO building liaison to discuss modifying your lab’s air change rate.	Ventilation is one of the largest costs of operating and maintaining a laboratory, accounting for as much as 20% of a lab’s operating costs, 15% of total building costs, and 40% of the heating bill (TSI- Lab Design Handbook).

2.0 RECYCLING & WASTE REDUCTION			
In our lab, we .			
#	Item Description	Suggested Action	Justification
2.1	Make recycling bins available to the laboratory and ensure nonhazardous, clean materials are recycled.	<p>Recycling in Emory labs is possible when a group of adjacent labs agrees to implement recycling. The Green Lab Team can consult on and facilitate this process.</p> <p>To download Emory's lab recycling and waste disposal protocol, click here or visit the Green Labs at Emory web page.</p> <p>To request bin labels or Emory's <i>What to Recycle in Labs</i> poster for your existing bins, or if you are unsure whether or not an item can be recycled, email greenlabs@emory.edu</p>	<p>Emory's recycling stream includes white paper, aluminum cans, corrugated cardboard, clear/brown/green glass, steel cans, mixed paper, notebooks & manuals, and plastic (including wrapper waste) (Emory OSI-Recycling).</p> <p>➤ <i>Pyrex glass cannot be recycled!</i></p>
2.2	Reuse envelopes, boxes, and packaging materials whenever possible.	Organize an area to maintain packaging materials suitable for redistributing or repurposing.	Approximately one-third of the material in an average landfill is packaging material (EPA-Municipal Solid Waste).
2.3	Use rechargeable batteries when possible and participate in the battery recycling program.	Refer to EHSO's Universal Waste Quick Facts to learn about proper battery recycling procedures. For a list of battery recycling receptacle locations, visit the OSI website . To request a battery recycling receptacle, email chemwaste@emory.edu .	Batteries contain a number of heavy metals and toxic chemicals that can contaminate the soil and pollute waterways (Bernardes et al.- Recycling of Batteries: a review of current processes and technologies).
2.4	Replace aerosols with non-aerosol alternatives when possible. If aerosols are necessary, they are returned to EHSO for draining and recycling.	All aerosol cans, whether full or empty, must be given to EHSO for disposal as chemical waste (Guidelines for Chemical Waste Disposal). Submit EHSO waste pickup requests to chemwaste@emory.edu .	Aerosol cans can present a unique hazard in that the pressurization of the container is often more dangerous than the compound within (Guidelines for Chemical Waste Disposal).

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2.5	Scale down experiments when possible to reduce materials used and waste produced.	Reduce scale of experiments and protocols to the minimum size necessary to achieve research objectives (ACS- Less is Better).	The “less is better” philosophy for chemical management can minimize adverse environmental effects, reduce risks to laboratory personnel, and enhance the safety practices of labs through advanced planning (ACS- Less is Better).
2.6	Redistribute unused chemicals within the building, or utilize the chemical redistribution program within EHSO.	Follow EHSO’s chemical disposal guidelines to donate surplus chemicals and participate in EHSO’s redistribution program (EHSO Waste Page).	Unused chemicals may constitute 40% or more of the hazardous waste stream generated in laboratories that have not emphasized waste minimization (ACS- Less is Better).
2.7	Redistribute unused supplies with other labs on campus.	Communicate with other labs to determine an effective means of coordinating shared resource opportunities regarding unused supplies. Ask your EHSO building liaison to send a notice to all labs on campus about free supplies.	Sharing unused supplies saves landfill space and reduces surplus equipment, supplies, and costs (Harvard- New Life for Lab Equipment).
2.8	Recycle used film.	If you generate any used or unused film, please contact EHSO at chemwaste@emory.edu to schedule a pickup.	Recycling film helps minimize clutter in darkrooms and reduce landfill waste. Photographic film also contains a small amount of silver that can be recycled (Biotechnology Process).
2.9	Participate in the ice pack reuse program.	View a list of ice pack recycling locations at Emory here . To request a bin at your building location, contact greenlabs@emory.edu .	Ice packs cannot be put into recycling bins because of their polymer gel content, but participating in a take-back program extends their lives through reuse.
2.10	Give redundant or non-used equipment to surplus for re-use by another lab or to recycle.	For non-capital equipment (not grant-funded and below \$4,999 purchase value): place a work request with Campus Services for reuse or recycling.	Donating equipment reduces surplus equipment, supplies, and costs (Harvard- New Life for Lab Equipment).

		For capital equipment (grant-funded or at least \$4,999 purchase value): contact the Office of Grants and Contracts for appropriate guidance. If capital equipment has reached its end of life, OGC will remove it from your department's asset list. Following this, complete a transfer form with Campus Services for pick-up and recycling of equipment.	
3.0 CHEMICALS			
In our lab, we . . .			
#	Item Description	Suggested Action	Justification
3.1	Find alternative solutions to radioactive materials when possible.	MIT's Green Chemical Alternatives Purchasing Wizard provides information on alternatives to hazardous chemicals or processes.	Radioactive materials accrue additional costs such as disposal, contamination surveying, and special training (NCBI- The Impact of Low Level Radioactive Waste Management Policy on Biomedical Research in the United States).
3.2	Review our chemical inventory prior to purchasing new chemicals to avoid duplication of stock.	A current and accessible inventory should be maintained and consulted by lab personnel.	An inventory management system minimizes waste generated from old, partially used containers, and helps to reduce overall inventory and duplicate purchases (ACS- Less is Better).
3.3	Use chemicals/reagents "first in, first out" per received dates.	Add "received dates" on chemical/reagent containers and place newly received materials behind older materials in storage areas.	A "first in, first out" system avoids degradation of older chemicals and their containers and the necessity to dispose of unused, degraded chemicals.
3.4	Utilize green chemistry methods, including computer simulations and micro-scale chemistry techniques when applicable.	MIT's Green Chemical Alternatives Purchasing Wizard provides information on alternatives to hazardous chemicals or processes. The EPA provides 12 principles for green chemistry .	Green chemistry consists of chemical products and processes that reduce or eliminate the use or generation of hazardous substances (EPA- Green Chemistry).

3.5	Substitute mercury-containing equipment with other alternatives when possible.	Try using alcohol-based thermometers instead of mercury thermometers. Work with equipment suppliers to see if non-mercury-containing equipment is available. Mercury-containing equipment (including thermometers) must be disposed of through EHSO. A waste pickup request should be submitted to chemwaste@emory.edu .	Mercury is a toxic and volatile chemical that produces indoor air contamination when leaked or spilled (NIH- Mercury Hazard Reduction Campaign).
4.0 PROCUREMENT			
In our lab, we . . .			
#	Item Description	Suggested Action	Justification
4.1	Share equipment whenever possible.	Communicate with other labs to determine an effective means of coordinating shared resource opportunities. Contact your EHSO building liaison if you need help.	Equipment sharing saves landfill space and reduces surplus equipment, supplies, and costs (Harvard- New Life for Lab Equipment).
4.2	Purchase products made from recycled materials whenever possible.	Look for items designated as being made of recycled materials by vendors.	Purchasing recycled products reduces landfill waste, conserves natural resources and energy, and promotes the market for recycled products (EPA- Waste Wise Tip Sheet).
4.3	Prioritize purchasing Energy Star equipment.	Look for Energy Star designation on vendor websites.	Energy Star products are part of a U.S. EPA program that helps businesses and individuals save money and reduce energy consumption through purchasing high-energy efficiency products (Energy Star).
4.4	Prioritize high-efficiency, low-flow fume hoods when purchasing new chemical fume hoods.	Contact Emory's Engineering Services to discuss fume hood options and determine if a low-flow fume hood is appropriate.	Low-flow fume hoods may reduce exhaust airflow by 75-80% without a decrease in containment performance (Lawrence Berkeley Labs- Low Flow Fume Hoods).

4.5	Utilize micro-scaling or volume ordering.	When possible, reduce chemical use to the lowest level at which experiments can be effectively performed (NHDES- Microscale). Consider volume ordering for materials that won't expire.	Micro scaling reduces chemical use, improves lab safety, saves money, and reduces experiment time (NHDES- Microscale). Volume ordering requires fewer transport deliveries, meaning fewer transport emissions. Bulk sizes can also reduce required packaging (Eco Office Supplies- Eco-tips).
4.6	Procure equipment from Emory Surplus before buying new when possible.	Refer to Campus Services' Surplus Property website to review inventory and purchase materials.	Using refurbished or surplus equipment extends the useful life of the equipment, keeps materials out of the waste stream, and reduces the demand for raw or virgin materials (The Loading Dock- Benefits of Reuse).
4.7	Use supplier take-back programs.	Request information from vendors for details of available take-back programs.	Take-back programs can be used for surplus supplies, ice packs, Styrofoam coolers, ink & toner cartridges , and/or packaging materials.
5.0 ENGAGEMENT			
In our lab, we . . .			
#	Item Description	Suggested Action	Justification
5.1	Inform and ask lab members to agree to follow the applicable actions on this checklist.		We recommend acquiring agreement from at least 75% of office occupants for maximum success.
5.2	Share information about our Green Lab certification with all new employees and encourage them to get involved.		
5.3	Discuss sustainability and the progress of our Green Lab certification at lab meetings.		

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5.4	Have at least one lab representative on the Office of Sustainability Initiatives e-mail list serv, and redistribute relevant information to lab members or post on a shared resource.	Please sign up for the OSI listserv here .	
5.5	Know who our building's Sustainability Representative is and communicate with them about any related inquiries and ideas.	Find your building's Sustainability Representative here .	
5.6	Promote and provide resources for alternative transportation options.	For information on available commute alternatives, visit the Transportation and Parking Services website here .	19% of Emory's CO2 emissions come from faculty, staff, and student commuting. Choosing an alternative helps Emory reach its goal of 20% reduction in greenhouse gas emissions by 2020. For more information on Emory's Climate Action Plan, visit here .
5.7	Provide information about the nearest recycling containers.		For a template of signage, please contact greenlabs@emory.edu .
5.8	Have 50% of our lab staff participating in Emory's Sustainability Pledge.		Locate and take or renew your Sustainability Pledge here .
6.0	INNOVATION		
	In our lab, we . . .		
#	Item Description	Suggested Action	Justification
6.1	Encourage innovative ideas from our employees regarding office-wide sustainability initiatives.	Labs can earn additional points for actions that are not listed in the checklist. Initiatives and corresponding points awarded are subject to committee approval.	

