Excerpt from Risk Assessment 5620 (Curtin University CHARM database).

This Risk Assessment was designed for a typical Chemistry Laboratory experiment (Titrimetric determination of acetic acid in vinegar) undertaken by undergraduate First Year students.

Risk Owner: Vicky Barnett; Date 21/03/2023.

RISK FACTOR(S)	EXISTING CONTROL(S)	RISK CLASS
COVID-19 (or other influenza pandemic) Safety Planning	Control: Curtin's management protocols will be adhered to.	Low
Unauthorised access to the lab (most commonly due to students misreading their timetable and trying to attend a lab class they are not registered into) and students working without approvals (most commonly for students who are not adequately prepared, either in regards to PPE or pre-lab activities).	Control: 1. Unauthorised access: Access to the lab is restricted to relevant teaching staff, UC, lab technician and students registered in the class. Updated class lists are made available to demonstrators, who meet students at the entrance and use a barcode scanner to scan their student ID cards. For students who do not have their ID card, a manual record is made. Any person who is not formally registered into that class is denied entry. (Exceptions may be made only with prior approval by the UC, and only if the lab class capacity and staff:student ratio is preserved). 2. Working without approvals: All students are required to complete a general safety induction prior to commencing lab work and be wearing appropriate PPE. All students are also required to complete a pre-lab exercise that demonstrates an awareness of the purpose of the experiment and procedures, as well as safety hazards and mitigation measures. These pre-labs are completed electronically and checked by demonstrators before the lab session. Demonstrating staff also give a pre-lab briefing prior to students commencing experimental work. With PPE donned and pre-lab exercises & briefing done, students are approved to commence working. Failure to meet these requirements means the student will not be approved to do the experiment and will be required to leave the lab. Accessibility considerations: Students requiring a support person. The support person must be approved as per the student's Curtin Access Plan (CAP), and must have undergone a lab safety briefing and must also be wearing closed in shoes, safety glasses and a lab coat.	Low
Overcrowding in the lab; Slips, trips and falls whilst working in the lab; Accessibility consideration: Inclusion of stools, chairs, wheelchairs introduces an additional trip hazard of	Control: At least one benchtop should have the drawers underneath removed so a stool can be placed under the bench if required by a student unable to stand for prolonged periods. Short-term: One lab workbench or the desk against the wall in the lab needs to be replaced by a lower desk with a height suitable for a seated student or wheelchair user. A standard-height	Low

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students tripping over stool, chair, wheelchair wheels when moving throughout the laboratory.	desk such as the ones used in (redacted locations) for similar activities would suffice. Longer term: one of the existing workbenches should be replaced with a height adjustable lab bench, with no obstructing drawers underneath, to be able to be used by a seated student if required. This bench should be located close to wash stations, safety showers and/or the lab entrance. Control: At least one supervisory staff member will be first aid trained. No more than 32 students will work in the lab at one time; Each bench has a capacity of 8 students, which will not be exceeded. Accessibility considerations: Neurodiverse: Depends on nature and severity. Students susceptible to sensory overload are to work on a workbench situated close to the entrance to the lab so that they can leave discretely and quickly if they need to, as per the student's CAP. Control: When students enter the lab they will store their bags in allocated shelving to keep walkways clear of obstacles. Common glassware is located nearby each workbench; specialised equipment and solutions will be located in clearly defined areas that are easily accessible, thus minimising students moving throughout the lab. Accessibility considerations: Mobility impairment: Students requiring a stool should work at a bench that doesn't have a cupboard underneath so the stool can be tucked under the bench when not in use; Seated students (e.g. wheelchair users) will require a lower workbench with no obstructions underneath so they have somewhere to work safely (& ergonomically). Whilst most materials used for the experiment are stored in cupboards and drawers within reach to a seated student, not all are (e.g. carboy dispensers; burette storage). Seated students will work with a lab partner who can acquire hard to reach equipment and reagents. Control: Accessibility consideration: Additional trip hazard by inclusion of stools, chairs, wheelchairs in the lab: 1. Chairs and stools to be pushed under laboratory bench when not in use 2. Seated students to be located at end of a row where possible 3. In emergencies follow the Curtin Emergency procedures and where a person has a PEEP in place, follow this plan (refer "Evacuation	

RISK FACTOR(S)	EXISTING CONTROL(S)	RISK CLASS
	for people with disability" in Curtin Emergency Response Handbook)	
Injury caused by broken glass (beakers, conical flasks, pipettes, burettes)	Control: At least one supervisory staff member will be first aid trained. Students are provided instructions for the correct and safe handling of specialised glassware before the experiment, in the form of written instructions (in the lab manual), instructional video links within the lab manual, and verbal information by supervising staff (demonstrators) prior to the experiment. Students are required to answer pre-lab questions before they can commence the experiment, which are checked by a demonstrator. One of the pre-lab questions requires students to consider chemical as well as physical hazards for the experiment, and what precautions they should take to mitigate these risks. Students are supervised at all times in the lab by trained staff; overcrowding of workspaces is avoided and the staff:student ratio is sufficient that staff can safely monitor students as they work. Accessibility considerations: Mobility impairment: Whilst common glassware used for the experiment is stored in cupboards and drawers within reach to a seated student, burettes and pipettes generally are not. Seated students will work with a lab partner who can acquire hard to reach equipment. Control: Accessibility considerations: Visual impairment: Depending on the severity, visually impaired students may have difficulty reading markings on the pipettes and burettes. These students may work with a partner who can take these readings. Alternatively, an automated pipette could be used by visually impaired students if appropriate. Automated pipettes could also be substituted for use by students with other conditions that make manipulation of manual pipettes difficult (e.g. sweaty hand syndrome, arthritis).	Low
Chemical exposure: students will be handling phenolphthalein indicator, acetic acid and sodium hydroxide. Phenolpthalein is flammable, can cause serious eye irritation, and is hazardous to health (suspected of causing genetic defects and may cause cancer).	Control: Phenolphthalein: Phenolphthalein indicator solution is made by dissolving a small quantity of phenolphthalein in ethanol and adding an equivalent volume of water. The indicator solution has a small concentration of phenolphthalein (~ 0.1%w/w) and is non-volatile and non-flammable once in its aqueous form (dissolved in water). Only very small quantities are used (2-3 drops per titration) and the indicator solution is contained in a small vial and dispensed using a dropper such that contact with the solution is avoided.	Medium

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Acetic acid is corrosive and can cause irritation to skin and damage to eyes. Sodium hydroxide is caustic and can damage skin and cause irreparable damage to eyes	Acetic acid: The acetic acid solution is commercial vinegar that is diluted by a factor of 1/7 prior to the experiment. Acetic acid is a weak acid, and the diluted solution will contain a very low concentration of this acid (~0.6 %w/w or 0.1 M). At this low concentration the solution is not considered hazardous. Sodium hydroxide: This will be available as an aqueous solution prepared prior to the experiment, with a concentration of ~ 0.1 M. At this low concentration the solution is not considered hazardous. In addition to the controls mentioned above, the following controls will also be applied: PPE - Safety glasses to be worn at all times. In the event of any chemicals splashed into eyes, eyewash station will be used to flush out eyes for at least 15 minutes. Lab coat will be worn at all times to protect clothing and skin from spills. In the event of a spill on skin or clothes the student will be instructed to rinse the affected area thoroughly. Gloves will be available to students who would prefer to wear them when handling the phenolphthalein indicator. Accessibility considerations: Pregnancy: Pregnant students/staff should avoid handling the phenolphthalein solution. If they do handle it, they must wear gloves when doing so. Mobility impairment: Standard PPE to be worn as with other students; Greater risk of chemical spill on upper legs (stool user) / lap (chair user) however, as the chemicals are dilute this added risk is manageable by situating the student's work bench close to a washing station, safety shower and/or exit so they can rinse the affected area more quickly and more easily if needed. Visual impairment: Depends on severity. Prescription glasses, if required, are to be worn underneath appropriately fitting safety glasses or goggles; Contact lenses are discouraged, but student needs to disclose if they are wearing them; Colour blindness will impede students ability to visualise the endpoint of the reaction (this relies on the capacity to visualise a colour change) - student can work with a lab partner or be shown how to track the titration reaction using a pH meter to determine the equivalence point graphically. Hearing impairment: Not impacted by this particular risk, however student to work with a lab partner without a hearing impairment and demonstrators are to be made aware, so that when the demonstrator gives verbal information to the class, or if an alarm goes off, the student has a way to also receive the information.	

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	Neurodiverse: Depends on nature and severity. This specific item poses no additional risk. The above accessibility considerations pertain to students who's injury or disability does not impede their capacity to manipulate glassware and handle the chemical solutions. Students requiring additional / alternate adjustments to those already stated will have these considered on a case-by-case basis, as per the student's CAP. For student's requiring a support worker, the support worker will be required to also undergo a lab safety induction and wear appropriate PPE, and be aware of the risks associated with the activities	
Added retrospectively: PSYCHOSOCIAL HARM Students excluded from a learning activity due to accessibility constraint will experience psychosocial harm.	Accessibility considerations: All *possible* actions must be taken to ensure accessibility to the laboratory learning experience for all enrolled students. This includes students with disability.	medium

Attachments referred to:

- Dowsett, Lachlan Research_Project_-_FINAL.pdf
- CHEMXXXX LabArchives student instructions for Determination of acetic acid in vinegar titration.pdf
- CHEMXXXX LabArchives general notes for conducting acid-base titrations.pdf
- CHEMXXXX LabArchives instructions for using a burette.pdf
- CHEMXXXX LabArchives instructions for using a volumetric pipette compressed file.pdf

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