

Unattended experiments

Unattended experiments:

Only reactions which are considered completely safe may be left unattended.

- All heating apparatus must be equipped with a temperature controller.
- All glass joints must be secure
- The tubing on reflux condensers must be secure and a water safety cut-out switch must be used.
- Vacuum and compressed gases must be set up safely and securely.

An unattended experiment form must be filled out for each unattended experiment. Copies must be displayed on the fume cupboard sash and in the entrance to the lab space. Risk assessments must also be available.

The following information must be available (in addition to the details of the experiment):

- Name of the person responsible.
- Name of the supervisor of the person responsible.
- A contact number for the person responsible.
- The time and date the experiment will conclude.
- Emergency action which should be taken by persons with no knowledge of the particulars of the experiment (eg. Service personnel or emergency services).

Please note that abbreviations for chemical names (DCM, THF, EtOH, etc.) are not to be used when filling in unattended experiment forms. In the event of an out-of-hours emergency these will most likely be consulted by Campus Services personnel rather than researchers familiar with these terms.

Once the experiment has concluded the unattended experiment forms or risk assessments **must** be removed from their displays.

Appendices:

1. School of Chemistry unattended experiment form (available as laminated card from Raymond Smith).
2. Example of acceptable risk assessment.

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School of Chemistry		
Unattended Experiment Form		
Lab:	Date:	Fume Cupbd No:
Name (of person responsible): 24 hour Contact No: Signature:		
List solvents and all hazardous chemicals (Do not write formulae!!)		
Possible Hazards (circle): <i>Fire</i> <i>Explosion</i> <i>Toxic Fumes</i> <i>Corrosion</i> <i>Avoid contact with skin</i> <i>other (specify)</i>		
Apparatus:		
Services required (circle): Water electricity heat inert gas vacuum other (specify)		
Emergency action:		
Supervisor (or Alternative Supervisor): Signature:		

- 2 copies required. Please place one on fume cupboard and the other in the box provided outside the lab-door.
- NB: Remove this form from the box when experiment is complete
- Leave light on in fume cupboard containing this experiment
- Please refer to School of Chemistry SOP for Unattended Experiments

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Persons completing this assessment should refer to the [UCD Chemical Safety Manual](#) and must review the SDS for the chemicals concerned

1. General Information

Name of Person(s) involved in the Process and their Position	Raymond Smith
Principal Investigator / Supervisor (Person responsible for ensuring safety)	Raymond Smith
Date of Assessment	17-07-23
Location of Works	S2.70
Frequency of Process / Chemical in use	5x per year on large scale

2. Title and Details of the Process Involving the use of Hazardous Agents –give details of the process(es) in question - if necessary, attach a written procedure.

Title of Process: Preparation of acetaminophen
Details: 20 g 4-aminophenol dissolved in 100 ml water in a 1 L conical flask. 22 ml acetic anhydride added via graduated cylinder. Mixture heated for 60 minutes at 80°C with constant stirring. Mixture cooled and vacuum filtered. Crude redissolved in minimum amount of hot water before addition of charcoal. Hot filtration, followed by cooling, crystallisation, and vacuum filtration.

3. Potential Experimental / Reaction Outcomes (give details where applicable)

Exothermic: Explosive:
 Release of gas / vapours: Pressurisation:
 Generation of unstable compounds: Effects on normal atmospheric conditions:
 Other: n/a

4. Hazardous Agent(s) to be used

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Chemical name (or formula where no name)	4-aminophenol	Hazard Statements		H302 + H332 Harmful if swallowed or if inhaled; H341 Suspected of causing genetic defects; H410 Very toxic to aquatic life with long lasting effects.				
Hazard Class		Precautionary Statements		P273 Avoid release to the environment; P280 Wear protective gloves/ protective clothing/ eye protection/ face protection; P301 + P312 IF SWALLOWED: Call a POISON CENTER/ doctor if				
Signal Word								
Amount	20 g							
Form	Solid							

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			<p>you feel unwell; P302 + P352 IF ON SKIN: Wash with plenty of water; P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell; P308 + P313 IF exposed or concerned: Get medical advice/ attention.</p>
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	GHS02				GHS06				
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Chemical name (or formula where no name)		Acetic anhydride		Hazard Statements		<p>H226 Flammable liquid and vapour; H302 Harmful if swallowed; H314 Causes severe skin burns and eye damage; H330 Fatal if inhaled; H400 Very toxic to aquatic life.</p>			
Hazard Class									
Signal Word				Precautionary Statements		<p>P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking; P280 Wear protective gloves/ protective clothing/ eye protection/ face Protection; P301 + P312 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel Unwell; P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water; P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor; P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p>			
Amount		22 ml							
Form		Liquid							

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Chemical name (or formula where no name)		Activated charcoal		Hazard Statements		<p>Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.</p>			
Hazard Class									
Signal Word				Precautionary Statements					
Amount		0.1 g (approx.)							
Form		Solid							

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						GHS07 		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical name (or formula where no name)		Acetaminophen		Hazard Statements		H302 Harmful if swallowed; H315 Causes skin irritation; H317 May cause an allergic skin reaction; H319 Causes serious eye irritation.		
Hazard Class								
Signal Word				Precautionary Statements		P264 Wash skin thoroughly after handling; P270 Do not eat, drink or smoke when using this product; P301 + P312 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel Unwell; P501 Dispose of contents/ container to an approved waste disposal plant.		
Amount		28 g (theoretical)						
Form		Solid						

Has a safer alternative been considered (give details)? No. Materials used are sufficiently safe under the given conditions/control measures.

Provide scientific justification for the continued use of chemicals classed as Carcinogen, Mutagen or Reproductive Toxin: 4-aminophenol is an essential starting material for this process.

Are any of the chemicals in use incompatible (give details): No

Check potential reactions with the [Chemical Reactivity Worksheet](#)

Location of SDS for each Chemical: Shared Google Drive. 2nd Floor Videos and Documents → Risk Assessments and SDS → Semester 1 → CHEM00010. Also available on Quartzly in 2nd Floor Teaching Labs inventory.

5. Potential Exposure

a) Who (and how many) could potentially be exposed to these chemicals	1 – Raymond Smith
b) Is there a part of the process which could lead to a release of the chemical into the air or onto a surface (give details)? What controls are in place to prevent this?	Nothing inherent to the procedure. Reaction and purification are performed in a fumehood to contain any possible release from glassware breakages, etc.
c) What are the potential routes of exposure? (Inhalation, ingestion, dermal, transplacental, sharps)	Inhalation (again, reduced by fumehood) and dermal (reduced by PPE)
d) What is the chance of the exposure occurring? (Unlikely, Likely, Very Likely)	Unlikely
e) Concentration / intensity, duration and frequency of exposure	Low

6. Controls in Place

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a) PPE in use	Lab Coat: <input checked="" type="checkbox"/> Safety Glasses: <input checked="" type="checkbox"/> Safety Goggles: <input type="checkbox"/> Face Shield: <input type="checkbox"/> Gloves: <input checked="" type="checkbox"/> (indicate type) Nitrile Other: <input type="checkbox"/> (give details) _____
b) Engineering controls	Fume hood: <input checked="" type="checkbox"/> LEV / Desk Exhaust: <input type="checkbox"/> Other:
c) Other controls	Temperature probe/controller to regulate heating
d) Storage arrangements (ensure incompatibles are separated)	Starting materials stored separately
e) Waste disposal procedure	All washings disposed of via non-halogenated waste

7. Further Risk Control Measures *These additional risk control measures should be designed to tackle the hazards identified in Sections 4, 5, and 6 above. All questions must be answered.*

a) Can any of the hazardous agents be replaced with less hazardous materials? (give details)	No.
b) Can the amount of chemical in use be reduced?	Only by reducing scale of reaction and repeating several times.
c) Can the duration / intensity of exposure / numbers of persons exposed be reduced?	No
d) Are further safety / hygiene facilities required?	No
e) Is warning signage required?	No
f) Are transport or storage arrangements contributing to risk?	No
g) Is appropriate first aid equipment / antidotes available?	Yes
h) Is additional safety equipment required?	No
i) In the case of carcinogens are storage and labelling provisions adequate?	n/a
j) In the case of carcinogens can a sealed working system be used?	n/a
k) In the case of carcinogens does the working area require demarcation?	n/a
l) In the case of carcinogens do the users require medical surveillance?	n/a
m) Can the process be modified to reduce exposure risks?	No. Risks are already heavily limited.
n) Is further training for personnel required?	No
o) Can different equipment be used to control risk?	No. Equipment being used is adequate.
p) Is further PPE required?	No
q) Can engineering controls be put into place?	No additional engineering controls necessary
r) Is the product of the process creating a high	Product is not high risk

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risk that can be reduced?	
s) Does the working area require demarcation?	No
t) Are safe handling procedures in place?	Yes
u) Is occupational exposure monitoring required?	No
v) Do ignition sources require isolation?	No ignition sources nearby
w) Can the emergency responses be improved?	No – responses are sufficient
x) Is health surveillance required?	No

8. Covid 19 Person to Person / Environmental Risks and Controls

This section only relates to risks from other persons and the environment, not from handling Covid 19 material. Handling Covid 19 material must be assessed via a Biological Agents Risk Assessment .	
a) Risk Level of work (as per UCD High Level Covid 19 Risk Assessment)	<input checked="" type="checkbox"/> Acceptable Risk (Complete parts b - j below) <input type="checkbox"/> Requires Task Specific Covid 19 Risk Assessment and attach with this document (Contact with High Risk Persons ¹ or Higher Risk Contact ²)
b) Controls in place	<input checked="" type="checkbox"/> Only attending work when well <input checked="" type="checkbox"/> Physical distancing maintained at all times <input checked="" type="checkbox"/> Good hand, respiratory and general hygiene measures <input checked="" type="checkbox"/> Adherence to HSE guidance on self-isolation in specified circumstances <input type="checkbox"/> Use of Work Pod model as appropriate <input checked="" type="checkbox"/> UCD Covid 19 Induction Training completed
c) Physical distancing measures in place (Outline how physical distancing will be maintained at all times)	n/a
d) Details of work pod in place	n/a
e) PPE in use	Lab Coat: <input checked="" type="checkbox"/> Safety Glasses: <input checked="" type="checkbox"/> Safety Goggles: <input type="checkbox"/> Face Shield: <input type="checkbox"/> Mask: <input type="checkbox"/> (indicate type ³) _____ Gloves: <input checked="" type="checkbox"/> (indicate type) _____ Apron / Gown / Coverall <input type="checkbox"/> (indicate type) _____ Other: <input type="checkbox"/> (give details) _____
f) Waste disposal procedures	All chemical washings into non-halogenated waste.

¹ Contact with persons known or suspected of carrying the virus

² Spending more than 15 minutes in the same space as another person not known or suspected of having the virus, but without applying physical distancing / repeated contact at less than 1m irrespective of the PPE being worn stay.

³ HSE Guidance on the [Safe Use of Masks](#)

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	All sharps/hard plastic waste into blue barrel. All chemically contaminated waste into red bags. All other waste into general waste bins.
g) Hygiene Practices	<input checked="" type="checkbox"/> No eating or drinking in work area <input checked="" type="checkbox"/> Hand washing Facilities Available <input checked="" type="checkbox"/> Hand sanitiser Available <input checked="" type="checkbox"/> No insertion of objects into mouth <input checked="" type="checkbox"/> Do not touch your face with gloved hands or if hands not clean <input checked="" type="checkbox"/> Avoid shared equipment Other: _____(Give details)
h) Cleaning and disinfection Protocols in place (give details)	Clean all benches with disinfectant wipes and/or 70% isopropanol.

9. Emergency Responses (Consult relevant SDS for further information)

	Response Measures	Location of kits / specialist or response equipment
a) Fire	<i>If small, attempt to extinguish fires with a CO2 extinguisher. If the fire cannot be contained, evacuate area and obtain assistance.</i>	<i>Extinguishers located just outside lab in corridor</i>
b) First Aid	<i>Contact local first aider for assistance</i>	<i>List of first aiders beside phone and first aid kit, next to lab oven.</i>
c) Accidental Release/ Spill Response	<i>Small spills of any of the above can be wiped up with paper towel (while wearing nitrile gloves) and rinsed into the aqueous waste with acetone.</i> <i>Larger spills should be soaked up (after evacuating the area) with polypropylene spill sheets and disposed of via red bags.</i> <i>Spill areas should then be wiped with 70% isopropanol.</i>	<i>Spill kit located underneath lab oven.</i>

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10. Risk Rating

		Severity		
		Low	Medium	High
Likelihood	Low	Trivial	Acceptable	Moderate
	Medium	Acceptable	Moderate	Substantial
	High	Moderate	Substantial	Intolerable

Assessment of likelihood and Severity

	Severity of Outcome	Likelihood of Exposure
Low	Slightly Harmful	Unlikely
Medium	Harmful	Likely
High	Very Harmful	Very Likely

Severity	Likelihood	Risk Rating
Medium	Low	Acceptable

1. **Trivial Risk:** No further action needed
2. **Acceptable Risk:** No additional risk control measures required
3. **Moderate Risk:** Implement further risk control measures if possible
4. **Substantial Risk:** Further control measures must be implemented. If this is not possible then work must be strictly managed to ensure safety.
5. **Intolerable:** Work must be prohibited until further control measures are implemented.

Is the risk rating acceptable: Yes: No:

If yes sign and date below and ensure all risk control measures have been implemented.

If no identify further control measures and reassess risk. If the risk cannot be reduced to an acceptable level then the process cannot be carried out.

Is this work suitable for lone working: Yes: No:

Signed:	Date:	Position:
Raymond Smith	17-07-23	Senior Technical Officer
_____	_____	_____

Signed:	Date:	Position:
_____	_____	_____

This document must be signed by the person carrying out the assessment and their academic supervisor / manager (person responsible for ensuring safety).