

Experiment-Based Risk Assessment Form

Name of Department	Chemistry	Location of Lab	S5-04 and S5-01
Name of Laboratory	Synthesis Chemistry and General Chemistry Teaching Labs	Name of PI	Dr Hoang Truong Giang
Name of LO	Tan Lay San; Teo Ai Hwee Irene; Irwan Iskandar Bin Roslan	Name of Activity/Experiment	CM2191 Synthesis of Banana Oil

No	Description/Details of Steps in Activity	Hazard Identification			Risk Evaluation and Controls					
		Hazards	Possible Accident / Ill Health & Persons-at-Risk	Existing Risk Control (Mitigation)	Severity	Likelihood (Probability)	Risk Level	Additional Control	Person Responsible	By (Date)
1	To a 50 mL dry round bottom flask containing a stir bar, add isopentanol (4.3 mL) and acetic acid (4 eq). Slowly and carefully add concentrated sulfuric acid (0.5 eq), while swirling and cooling the flask. Close the rbf with a plastic stopper when transporting it back to your fumehood. Assemble the apparatus and maintain the reaction mixture at reflux for 1 hour. Remove the heating apparatus and cool the reaction mixture to room temperature. Add 20 mL of distilled water into a 100 mL separatory funnel. Slowly transfer the cooled mixture into the separatory funnel. Be careful while transferring the acidic solution. Rinse the round bottom flask with 5 mL of distilled water, and add this rinsing to the separatory funnel.	Physical Hazards Glass breakage and mishandling of chemicals.	(1) Cut injuries from broken glassware, contact with chemicals and inflammation.	(1) Proper PPE should be worn. (2) Conduct the whole experiment in a well-ventilated fumehood. (3) Avoid direct contact with the chemicals.	1	1	1			
		Chemical Hazards Isopentanol is flammable and is an irritant.	(1) Fire hazards when in contact with hot surfaces (2) Irritation upon contact with skin or eyes.	(4) Use tongs/brush/broom to dispose broken glassware into the broken glass/sharps box.	1	1	1			
1	Concentrated sulfuric acid is highly corrosive and can give off acidic fumes. Addition to mixture may be highly exothermic, especially to moisture. Physical Hazards Reflux reaction is very hot.	Chemical Hazards Acetic acid is flammable and corrosive.	(1) Fire hazards when in contact with hot surfaces (2) Irritation and burns upon contact with skin, eyes, or if swallowed.	(5) Visual inspection of glassware before use, ensure that they are dry. (6) Keep chemicals/wires/condensor rubber tubing away from directly contacting the hotplate or hot surfaces.	2	1	2			
		Chemical Hazards Concentrated sulfuric acid is highly corrosive and can give off acidic fumes. Addition to mixture may be highly exothermic, especially to moisture.	(1) Severe burns upon contact with skin, eyes, swallowed or inhaled. (2) Hot mixture may fume and overflow.		2	1	2			
2	Swirl the funnel and drain the aqueous layer. Slowly add 10 mL of saturated sodiumhydrogencarbonate solution to the separatory funnel. Gently swirl the uncapped funnel and to aid the release of carbon dioxide. Make sure that there is no more gas bubbles evolving from the solution and check the pH before doing the extraction. Dry the crude ester with anhydrous magnesium sulfate and let the	Physical Hazards Pressure build-up in the separatory funnel. Breackage of separatory funnel if mishandled.	(1) Large pressure build-up can force reaction mixture out of the stopper or break the glassware. (2) Cut injuries from broken glassware, contact with chemicals and inflammation.	(1) Proper PPE should be worn. (2) Carry the whole experiment in the fumehoods. (3) Conduct the whole experiment in a well-ventilated fumehood. (4) Avoid direct contact with the chemicals. (5) Use tongs/brush/broom to dispose broken glassware into the broken glass/sharps box. Use a metal ring to hold the funnel instead of clamps. (6) Release air pressure when doing	2	1	2			
		Physical Hazards Pressure build-up in the separatory funnel. Breackage of separatory funnel if mishandled.	(1) Large pressure build-up can force reaction mixture out of the stopper or break the glassware. (2) Cut injuries from broken glassware, contact with chemicals and inflammation.		1	1	1			

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	<p>solution stand for 10-15 minutes. Remove the drying agent by gravity filtration and collect the crude product in a clean, dry 25 mL round bottom flask.</p>	<p>Chemical Hazards Sodium hydrogencarbonate is an irritant.</p>	<p>(1) Irritation upon contact with skin or eyes.</p>	<p>1</p>	<p>1</p>	<p>1</p>		
	<p>Set up distillation to isolate the product.</p>	<p>Chemical Hazards Magnesium sulfate is an irritant.</p>	<p>(1) Irritation upon contact with skin or eyes, causes harm if swallowed.</p>	<p>2</p>	<p>1</p>	<p>2</p>		
3	<p>Set up distillation to isolate the product.</p>	<p>Physical Hazards Distillation set-up is hot.</p>	<p>(1) Fire and electricity hazards if hot surfaces such as hotplate and rtf are in contact with wires or chemicals.</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>(1) Proper PPE should be worn. (2) Carry the whole experiment in the fumehoods. (3) Keep chemicals/wires/condensor rubber tubing away from directly contacting the hotplate or hot surfaces.</p>	
4	<p>FT-IR analysis.</p>	<p>Chemical Hazards Potassium bromide is an irritant.</p>	<p>(1) Irritation upon contact with skin or eyes, causes harm if swallowed.</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>(1) Proper PPE should be worn.</p>	
5	<p>Preparing 1H NMR sample.</p>	<p>Chemical Hazards CDCl₃ is an irritant and is possibly carcinogenic.</p>	<p>(1) Irritation upon contact with skin or eyes, causes harm if swallowed or inhaled.</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>(1) Proper PPE should be worn. (2) Carry the whole experiment in the fumehoods.</p>	

Conducted By

Name Dr Hoang Truong Giang

Signature 

Date July 6, 2022

Approved By

Name Assoc Prof Yeo Boon Siang, Jason

Signature 

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