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Experiment-Based Risk Assessment Form

Name of Department	Chemistry	Location of Lab	S5-01
Name of Laboratory	General Teaching Lab	Name of PI (lecturer-in-charge)	Thyagarajan Saradha / Jeremiah Chen
Name of LO	Teo Ai Hwee Irene / Irwan Iskandar Bin Roslan	Name of Activity/Experiment	CM2143 Cyclic and Linear Sweep Voltammetry (CV and LSV)

Hazard Identification				Risk Evaluation & Control						
No	Description / Details of Steps in Activity	Hazard(s)	Possible Accident(s) or ill Health, and Persons-at-Risk	Existing Risk Control (Mitigation)	Severity	Likelihood (probability)	Risk Level	Additional Risk Control	Person Responsible	By (Date)
1	<b>Part 1: Data Collection for <math>K_3Fe(CN)_6</math> Background CV</b> Fill a 100mL beaker with about 50 mL 0.1M $KNO_3$ . Assemble the counter, reference and working electrodes into the solution as shown in figure 1 of manual. Begin scan at 0.7 V and reverse scan at -0.3 V to 0.7 V at scan rate of 100 mV/s. Refer to SOP (next to machine).	1) Glass breakage from glass apparatus or electrode apparatus.	- Injury from broken glass or electrode.	- Visual inspection of glassware and electrode apparatus before use to ensure that there are no cracks. - Do not use bare hands to pick up any broken pieces. Ensure proper disposal into the designated broken glass container / box.	1	1	1			
		2) Chemical contact from accidental spillage. i) Potassium nitrate: skin irritant, eye irritant, oxidant.	- Skin irritation or eye injury upon contact (irritant). Prolonged exposure may cause skin burns, ulcerations, respiratory irritation. - Harmful if ingested or inhaled.	- Proper PPE (gloves, goggles, lab coat) to be worn. - No eating or drinking in the lab. - Minimise the amounts and concentration of chemicals used (<100 mL, <1M).	1	1	1			
		3) Electric hazard when operating the electrode device.	- Possible electric shock from malfunctioning of equipment, electric socket or wires that are improperly exposed.	- Check that the device is in good working condition and that all cables are properly insulated. - Handle the electric switches only with dry hands. - Keep solutions away from electrical sources.	2	1	2			
2	<b><math>Fe(CN)_6^{3-}/Fe(CN)_6^{4-}</math> CV</b> Replace above blank with 50 mM $K_3Fe(CN)_6$ . Record CV with the above parameters. Record the Positions, in V and the Heights in A, of the peaks. The gold electrode can be cleaned by scanning repeatedly in 0.5M NaOH if the $\Delta E_p$ is not < 250 mV.	1) Glass breakage from glass apparatus or electrode apparatus.	- Injury from broken glass or electrode.	- Visual inspection of glassware and electrode apparatus before use to ensure that there are no cracks. - Do not use bare hands to pick up any broken pieces. Ensure proper disposal into the designated broken glass container / box.	1	1	1			
		2) Chemical contact from accidental spillage. i) 0.5M NaOH: corrosive, irritant, permeator	- Skin irritation or <b>eye</b> injury upon contact (irritant and corrosive). - Harmful if ingested or inhaled. - Exothermic reaction if in contact with acids.  Additional notes for NaOH: The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death.	- Proper PPE (gloves, goggles, lab coat) to be worn. - No eating or drinking in the lab. - Minimise the amounts and concentration of chemicals used (<50 mL, <1M). - Clean up any spills immediately. - Keep chemical away from acids.	2	1	2			

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		3) Electric hazard when operating the electrode device.	- Possible electric shock from malfunctioning of equipment, electric socket or wires that are improperly exposed.	- Check that the device is in good working condition and that all cables are properly insulated. - Handle the electric switches only with dry hands. - Keep solutions away from electrical sources.	2	1	2		
3	<b>Current dependence on scan rate for CV</b> Set potential limits identical to the background CV. Record CVs at 20, 50, 100 & 200 mV/s with the 3 electrodes in 50 mM $K_3Fe(CN)_6$ . Stir the solutions vigorously for 10 seconds prior to the next CV. Ensure no bubbles remain on the electrodes.	1) Glass breakage from glass apparatus or electrode apparatus.	- Injury from broken glass or electrode.	- Visual inspection of glassware and electrode apparatus before use to ensure that there are no cracks. - Do not use bare hands to pick up any broken pieces. Ensure proper disposal into the designated broken glass container / box.	1	1	1		
		2) Chemical contact from accidental spillage. i) Potassium ferricyanide: irritant	- Skin or eye irritation upon contact (irritant and corrosive). - Harmful if ingested or inhaled.	- Proper PPE (gloves, goggles, lab coat) to be worn. - No eating or drinking in the lab. - Minimise the amounts and concentration of chemicals used (<50 mL, <1M).	1	1	1		
		3) Electric hazard when operating the electrode device.	- Possible electric shock from malfunctioning of equipment, electric socket or wires that are improperly exposed.	- Check that the device is in good working condition and that all cables are properly insulated. - Handle the electric switches only with dry hands. - Keep solutions away from electrical sources.	2	1	2		
4	<b>Determination of <math>[K_3Fe(CN)_6]</math> in unknown</b> Fill 100 mL beaker with 50 mL unknown. Set potential identical to the background CV. Record CV at 100 mV/s. Repeat above steps with 50 mM $K_3Fe(CN)_6$ and 3 other standards prepared according to instructions in manual.	1) Glass breakage from glass apparatus or electrode apparatus.	- Injury from broken glass or electrode.	- Visual inspection of glassware and electrode apparatus before use to ensure that there are no cracks. - Do not use bare hands to pick up any broken pieces. Ensure proper disposal into the designated broken glass container / box.	1	1	1		
		2) Chemical contact from accidental spillage. i) Potassium ferricyanide: irritant	- Skin or eye irritation upon contact (irritant and corrosive). - Harmful if ingested or inhaled.	- Proper PPE (gloves, goggles, lab coat) to be worn. - No eating or drinking in the lab. - Minimise the amounts and concentration of chemicals used (<50 mL, <1M).	1	1	1		
		3) Electric hazard when operating the electrode device.	- Possible electric shock from malfunctioning of equipment, electric socket or wires that are improperly exposed.	- Check that the device is in good working condition and that all cables are properly insulated. - Handle the electric switches only with dry hands. - Keep solutions away from electrical sources.	2	1	2		
5	<b>Steady State Linear Sweep Voltammetry (LSV)</b> Change method from CV to LSV (refer to instrument and lab manuals). Begin at 0.7 V and end scan at -0.3 V, at scan rate of 100mV/s.	1) Glass breakage from glass apparatus or electrode apparatus.	- Injury from broken glass or electrode.	- Visual inspection of glassware and electrode apparatus before use to ensure that there are no cracks. - Do not use bare hands to pick up any broken pieces. Ensure proper disposal into the designated broken glass container / box.	1	1	1		
		2) Chemical contact from accidental spillage. i) Potassium ferricyanide: irritant	- Skin or eye irritation upon contact (irritant and corrosive). - Harmful if ingested or inhaled.	- Proper PPE (gloves, goggles, lab coat) to be worn. - No eating or drinking in the lab. - Minimise the amounts and concentration of chemicals used (<50 mL, <1M).	1	1	1		

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		3) Electric hazard when operating the electrode device.	- Possible electric shock from malfunctioning of equipment, electric socket or wires that are improperly exposed.	- Check that the device is in good working condition and that all cables are properly insulated. - Handle the electric switches only with dry hands. - Keep solutions away from electrical sources.	2	1	2			
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**Conducted By**

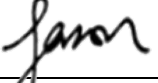
Name Thyagarajan Saradha / Jeremiah Chen

Signature  

Date 22/7/2022

**Approved By**

Name Assoc Prof Yeo Boon Siang, Jason

Signature 

Approval date 22/7/2022      Next Revision date (Maximum 3 years) 22/7/2025