


## GENERAL HEALTH AND SAFETY RISK ASSESSMENT FORM

<b>Site</b>	Off campus	<b>Department</b>	School of Metallurgy and Materials	<b>Version / Ref No.</b>	1
<b>Activity Location</b>	At science festivals and in people's homes	<b>Activity Description</b>	CoCoElectro Bag activities		
<b>Assessor</b>	Chris Hamlett	<b>Assessment Date</b>	02/06/2023	<b>Date of Assessment Review</b>	02/06/2024
<b>Academic / Manager Name</b>		<b>Academic / Manager Signature</b>			

- The 'CoCoElectro Bag' project involved disseminating bag of science equipment at science festivals. The recipients of the bags then carry out the experiments at home.
- Given that there are multiple activities assessed in this risk assessment a description of each is given in the 'Activity protocol' session towards the end of this document.

Hazard Assessment				Control Assessment						Actions						
Hazard Category	Hazards Identified	Who might be harmed? Staff Students Contractors Others	How might people be harmed?	Existing Control Measures			Initial Risk Rating		Are these adequate? ? Yes/No	Changes to/ Additional Controls	Residual Risk Rating			Owner	Due Date	Action Complete
							S	L			R	S	L			
<b>Fire risk</b>	Incorrect battery storage and disposal  Experiments : 1, 6, 7	Participants	Incorrect storage of a battery (e.g. at too high a temperature or loose) may result in the battery becoming damages (if stored to high) or short circuit (if stored loose and	<ul style="list-style-type: none"> <li>• Use only commercially available batteries</li> <li>• When a bag is signed up for explain the importance of correct battery usage to an adult responsible for the bag recipient.</li> </ul>	4	1	4	Yes								

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					S	L	R			S	L	R			
			<p>the two terminals of the battery connect).  This may initiate a fire</p>	<ul style="list-style-type: none"> <li>Do not use any battery if it appears damaged</li> </ul> <p><b>Storage</b></p> <ul style="list-style-type: none"> <li>Store the batteries in a cool / room temperature place</li> <li>Once opened from packaging store the coin cell (CR2032 battery – <b>experiment 1</b>) on its own in the screw top plastic container provided</li> <li>Once opened keep the AAA batteries in the UV torch (<b>Experiment 6</b>)</li> <li>Store the 9V battery (<b>experiment 7</b>) on its own in the screw top plastic container provided and ensure the terminals are covered with insulating tape (a roll is provided in the CoCoElectro Bag)</li> </ul> <p><b>Disposal</b></p> <ul style="list-style-type: none"> <li>Do not dispose of batteries in the usual, mixed household water (this may short circuit the battery posing a fire risk)</li> </ul>											

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					S	L	R			S	L	R			
				<ul style="list-style-type: none"> <li>Dispose of in designated battery recycling bins – these are often found in supermarkets or other shops in the local community.</li> </ul>											
<b>Poisoning</b>	Batteries  Experiment(s): 1, 6, 7	Participants	By swallowing a battery (especially the coin cell as they are the smallest)	<ul style="list-style-type: none"> <li>When a bag is signed up for explain the importance of correct battery usage to an adult responsible for the bag recipient.</li> </ul> <p>If using the batteries with young children adult supervision is required</p> <p>If swallowed get your child to A&amp;E as soon as possible and feed them 2 teaspoons of honey every 10 mins to reduce damage to internal tissue (advice form Alder Hey Children's Hospital:  <a href="https://alderhey.nhs.uk/contact-us/press-office/latest-news/what-do-if-your-child-swallows-button-battery#:~:text=The%20most%20important%20thing%20to,are%20older%20than%2012%20months">https://alderhey.nhs.uk/contact-us/press-office/latest-news/what-do-if-your-child-swallows-button-battery#:~:text=The%20most%20important%20thing%20to,are%20older%20than%2012%20months</a>.  </p>	5	1	5	Yes							
<b>Cuts</b>	Scissors / knife (Expt 1, 2, 8)	Participants	By cutting their fingers on sharp edges	<ul style="list-style-type: none"> <li>Take care when using scissors / kitchen knife</li> </ul>	2	1	2	Yes							

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					S	L	R			S	L	R			
	Broken marbles and sharp edges on metal bottle tops  (Expt 4)			<ul style="list-style-type: none"> <li>Young children should be supervised by an adult when using scissors / knife</li> <li>Inspect the marbles before starting the activity and remove any that look cracked or chipped.</li> <li>Inspect the metal bottle caps and dispose of any that are sharp.</li> </ul>											
Slips	Spilled liquid (Expt 3, 4, 7, 8)  Loose wooden blocks (Expt 10)	Participants and others in the immediate vicinity	Slipping on spilled water	<ul style="list-style-type: none"> <li>The experiment is to be carried out over a spill tray.</li> <li>Any pouring of liquid is to be done over a bucket or large bowl.</li> <li>If any water is spilled it is to be mopped up <b>IMMEDIATELY</b></li> <li>If any wooden blocks are dropped on the floor pick them up immediately</li> </ul>	2	1	2	Yes							
Puncture wound	Zinc nail, drawing pin (Expts 2, 7)	Participants	Puncturing their finger with a nail or pin	<ul style="list-style-type: none"> <li>Take care when pushing the nail (Expt 2) into the carrot / other fruit or vegetable</li> <li>When pushing the drawing pin through the plastic cup (Expt 7) push it slowly and try slightly twisting the pin as you do</li> </ul>	2	1	2	Yes							
Burns	Using an oven (Expt 5, 9)	Participant	Burning fingers when using the oven to bake their biscuits or cakes	<ul style="list-style-type: none"> <li>Use oven gloves</li> <li>Adult supervision required</li> </ul>				Yes							

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Allergic reaction	Baking with ingredients containing allergens (Expt 5, 9)	Participants	Allergic reaction to ingredients in the biscuits / cake mix	<ul style="list-style-type: none"> <li>An allergen free recipe is given in the booklet</li> <li>The adult(s) responsible for the participants should select an appropriate recipe to use</li> </ul>	3	1	3	Yes							
Eye / skin damage	UV torch (Expt 6)	Participant	Eye damage from the UV torch being shone in their eye Skin damage due to prolonged exposure to the UV torch	<ul style="list-style-type: none"> <li>Use a UV torch with no shorter than 395nm wavelength</li> <li>Warn the responsible adult about the UV torch when they sign up for the bag</li> <li>Include warning in the booklet</li> <li>Adult supervision required when the child uses the torch</li> </ul>	3	1	3	Yes							

## Risk Assessment Guidance

### Risk Scoring System

The scoring system is provided as a tool to help structure thinking about assessments and to provide a framework for identifying which are the most serious risks and why.

	Consequence / Severity score (severity levels) and examples of descriptors				
	1	2	3	4	5
Domains	Negligible	Minor	Moderate	Major	Catastrophic
<b>Impact on the safety of staff, students or public (physical / psychological harm)</b>	Minimal injury not requiring first aid or requiring no/minimal intervention or treatment.  No time off work	Minor injury or illness, first aid treatment needed or requiring minor intervention.  Requiring time off work for <3 days	Moderate injury requiring professional intervention  Requiring time off work for 4-14 days  RIDDOR / MHRA / agency reportable incident	Major injury leading to long-term incapacity/ disability (loss of limb)  Requiring time off work for >14 days	Incident leading to death  Multiple permanent injuries or irreversible health effects

Likelihood score	1	2	3	4	5
Frequency	Rare	Unlikely	Possible	Likely	Almost certain
<b>Broad descriptor</b>	This will probably never happen/occur	Do not expect it to happen/occur but it is possible it may do so	Might happen or occur occasionally	Will probably happen/occur but it is not a persisting issue	Will undoubtedly happen/occur, possibly frequently
<b>Time-framed descriptor</b>	Not expected to occur for years	Expected to occur at least annually	Expected to occur at least monthly	Expected to occur at least weekly	Expected to occur at least daily
<b>Probability</b> Will it happen or not?	<0.1 per cent	0.1–1 per cent	1.1–10 per cent	11–50 per cent	>50 per cent

The overall **level of risk** is then calculated by multiplying the two scores together.

$$\text{Risk Level} = \text{Consequence / Severity} \times \text{Likelihood (C x L)}$$

	Likelihood				
Likelihood score	1	2	3	4	5

	Rare	Unlikely	Possible	Likely	Almost certain
<b>5 Catastrophic</b>	5	10	15	20	25
<b>4 Major</b>	4	8	12	16	20
<b>3 Moderate</b>	3	6	9	12	15
<b>2 Minor</b>	2	4	6	8	10
<b>1 Negligible</b>	1	2	3	4	5

The Initial Risk Rating is the level of risk before control measures have been applied or with current control measures in place.

The Residual Risk is the level of risk after further control measures are put in place.

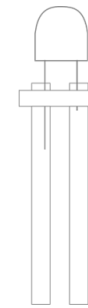
## Activity protocols

### Exp 1 -Paper circuits

- 1) Cut two short (~ 5cm) lengths of copper tape and stick them next to each other to make two tracks of tape
- 2) Take an LED and place the long leg on the left hand side track and place with tape.
- 3) Place a battery coin cell (negative side down) on the right hand
- 4) Connect the left hand side track to the top of the coin cell ('+' side) – what happens to the LED?
- 5) Repeat steps 1-4 but use brightly coloured insulating tape

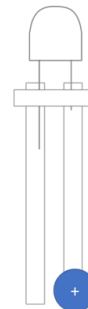


Step 1



Step 2

to each other (leaving a gap of about 3cm in between the short leg to the right hand side track and secure in side track side) – what happens to the LED?



Step 3



Step 4

your fingers!)

**Risks;** cut fingers (scissors), poisoning (swallowing coin cell)

### Exp 2 – Fruit and veg battery

- 1) Slice your fruit / veg into thick slices or segments (be careful of your fingers!)
- 2) Put a copper coin and a zinc nail into the fruit / veg segment (make sure they do not touch each other)
- 3) Connect the **copper** coin to the **long leg** of the LED
- 4) Connect the **zinc nail** to the **short leg** of the LED

**Risks;** Cut fingers (knife to cut fruit/veg), Puncture wound (zinc nail)



### **Exp 3 – Penny Battery experiment**

- 1) Dissolve salt in water
- 2) Place a washer in the middle of a piece of foil
- 3) Dip one piece of kitchen roll in the salt solution and shake off excess water
- 4) Put the copper coins on top of the kitchen roll and then the kitchen roll on top of the coins - this is your first battery cell!
- 5) Take an LED and put one of the legs onto 2p (that is touching the foil) and the other leg on top of the battery stack - does it light up at all?
- 6) Now repeat step 1-4 to more battery cells and experiment with trying to light the LED with more battery cells

#### **Risks**

Slip hazard - Salt solution. Excess liquid could drip onto the floor and someone could slip on it so clear up any spills immediately

### **Exp 4 - Separating Materials**

- 1) Place glass marbles, plastic bottle caps and metal bottle caps (about 10 of each) into a large bowl
- 2) Use a magnet to pick out the metal bottle caps and place these into a smaller bowl
- 3) Put enough water in the large bowl to allow the plastic bottle tops to float and enough room to scoop them out with the sieve.
- 4) Use a sieve to scoop out the plastic bottle tops and place these in a small bowl
- 5) Pour the water / glass marbles through the sieve and collect the water in a bucket and place the marbles in a small bowl

## *Solar Energy Experiments*

### **Exp 5 – Making a solar cell biscuit**

- 1) Make the biscuit dough using your favourite recipe
- 2) Cut out your biscuit using a cookie cutter
- 3) Bake it
- 4) Ice your biscuit

#### **Risks**

Burns – if baking biscuit there will be a risk of burns from the oven. Get an adult to help

Allergic reaction – make sure that ingredients that you are not allergic to are used

### **Exp 6 – Testing the Solar Bug**

- 1) Take a solar powered bug toy and a UV torch
- 2) Turn on the UV torch and shine onto the solar panel. The bug will start buzzing
- 3) Place a sheet of material (e.g. piece of paper or coloured cellophane / sweet wrapper) in between the UV torch and the solar panel to see which materials block UV light

#### **Risks**

**Eye damage** caused by UV torch – use a torch with wavelength no shorter than 395nm, include written warnings not to shine in eyes, make this clear to the responsible adult who signs the child up for the CoCoElectro Bag

**Fire hazard** – AAA batteries may pose a fire risk if incorrectly stored. These batteries are included with the UV torch and should be removed from their packaging and put into the UV torch

To dispose of the batteries DO NOT throw it in the general household rubbish. Instead take it to a battery recycling collecting bin which are often found in supermarkets and local convenience stores

## Hydrogen Experiments

### Exp 7 – Making Hydrogen

- 1) You will need the plastic cup, two drawing pins and a 9V battery.
- 2) Push the pins up through the bottom of the cup, make sure they do not touch each other and make sure that the top of the pins (the flat bit) will touch the terminal of the battery
- 3) Put water in the cup and add some bicarbonate of soda (available at most supermarkets or home baking stores)
- 4) Place your cell onto of the 9V battery – what happens at the sharp ends of the pins?

### Risks

**Puncture wounds** – from the drawing pins. Be careful when pushing the pins in and clear up and pins that are dropped on the floor

**Slip hazard** - Water. If dropped the spilled water will present a slip hazard. Clear up any spills immediately

**Fire hazard** – 9V battery. If the 9V battery is incorrectly stored they can start a fire if the two terminals are short circuited (e.g. by a metal object connects the two) which can cause the battery to overheat.

They should be stored separately, and the terminals covered with insulating tape when not in use.

A screw top plastic pot will be provided so the 9V battery can be stored in isolation.

To dispose of the battery DO NOT throw it in the general household rubbish. Instead take it to a battery recycling collecting bin which are often found in supermarkets and local convenience stores

Link: [9VoltBatterySafety.ashx \(nfpa.org\)](https://www.nfpa.org/9VoltBatterySafety.ashx)

## Exp 8 – Fluid storage

- 1) Place a sponge inside the square petri dish
- 2) Fill the 20ml measuring cylinder to the '25ml' mark.
- 3) Slowly pour the water onto the sponge until the sponge can absorb no more water (you may need to refill the measuring cylinder to the 25ml mark)
- 4) Take a second sponge and cut it up and repeat steps 1-3 – does a sponge with a larger surfaces area (i.e. one that has been cut up) absorb more water?

### Risks

**Slip hazard** - Water. Spilled water will present a slip hazard. Clear up any spills immediately

**Cuts** – if using scissors to cut the sponge take care not to cut your finger – ask an adult to help

*Li-ion battery*

## Exp 9 – Bake a battery

- 1) Make your cake mix using your favourite recipe
- 2) Put the batter in a tin
- 3) Bake it
- 4) Decorate and assemble your cake

### Risks

Burns – there will be a risk of burns from the oven. Get an adult to help

Allergic reaction – make sure that ingredients that you are not allergic to are used

### **Experiment 10 – Battery Jenga**

- 1) Put the stickers onto the Jenga blocks
- 2) Assemble the jenga blocks and remove the blocks as described in the booklet (i.e. quickly or slowly)

Risks

**Slip / trip** hazard – blocks that are scattered on the floor may present a trip hazard- clear them up immediately.