

Demonstration Risk Assessment Form

SCIENCE IN SCHOOLS- COMMUNITY SHOW
SEPTEMBER 2017

This is a 45-60min show containing all or some of the following demonstrations:

- Burning Jelly Baby
- Floating Water Trick
- Tyndall's light fountain
- Phone Book Tug of War
- Hand Generator with Microdet
- Exploding Flour Tin
- Exploding Flour Demo
- Electrolysis of water, with explosion
- Electrocuting a Gherkin
- Carbon Arc Lamp
- Alka seltzer rockets
- Large Electromagnet
- Van de Graaf generator with Barbie and Pie Dishes
- PTC Taste Test
- Cinnamon Taste Test
- Plasma Ball with Fluorescent Tube

Likelihood		Severity of impact		Current risk	
Certain	5	Death or total destruction	5	Multiply Likelihood and Severity of impact to get Current Risk rating	
High	4	Major injury or damage	4		
Medium	3	Serious injury or damage	3		
Low	2	Minor injury or damage	2		
Very low	1	Negligible	1		

Action Rating	
10 and above	The work is too dangerous and should not be undertaken
8 or 9	The work is high risk. Those undertaking the work must be fully competent and experienced for the type of work, equipment to be used and fully understand all risks present.
5 or 6	Moderate risk Workers must be fully competent for the type of work and risks present, or under competent supervision.
4	Low risk. Those undertaking the work must be aware or be made aware of the risks and mitigation measures required.
2 or 3	Slight risk. Those undertaking the work should be aware or be made aware of the risks and mitigation measures required.
1	Insignificant risk. Activity suitable for all workers

ACTIONS NEEDED BY VENUE:

Isolate Smoke/ Fire Alarms in vicinity of demonstrations
 Ensure presenter knows Fire Evacuations procedures
 Ensure presenter know location of nearest fire extinguishers

Risk assessed by: **Fran Scott**
 Date of last review: **12/09/2017**
 Review date:

11/03/2018

Demonstration: Burning Jelly Baby

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
<p>A few grams of potassium chlorate, an oxidizing agent, is held in a boiling tube in a laboratory clamp and stand. It is then melted and heated close to its boiling point with a blowtorch or Bunsen flame.</p> <p>Once at this point, a jelly baby is put into the tube so that it drops into the molten potassium chlorate. It reacts violently with a shrieking noise, creating a bright light and lots of smoke.</p>	Eye injury via multiple possible causes.	Eye protection must be worn throughout.	1	4	4
	<p>A relatively large amount of smoke is produced. It is not particularly harmful smoke (burnt sugar) but may cause coughing if inhaled in any quantity.</p> <p>The smoke may also set off fire alarms.</p>	<p>The demonstration should be performed only in a well ventilated environment and with audience members well clear (at least 3 metres).</p> <p>Smoke detectors in the same room should be isolated from the fire alarm system if possible</p>	4	1	4
	<p>It is possible, though unlikely, that all or some of the jelly baby will be ejected from the boiling tube during the reaction. It could then cause burning injury or start a fire.</p>	<p>The reaction must be performed behind a 3-sided polycarbonate screen, with the boiling tube directed so any flaming debris will strike the screen and be contained.</p> <p>The clamp and stand must be secure and stable, and the whole demonstration space within the safety screen protected with heat proof ceramic mats. Flammable materials must be kept well clear.</p> <p>If any material does escape the tube, it should be left to burn itself out on the ceramic mats. If for any reason this material escapes beyond the ceramic mats, it can be extinguished with a CO2 fire extinguisher, which must be on hand.</p>	2	3	6



<p>The tube will become extremely hot (around 400°C or more) it will remain hot for some time after the demonstration, risking burning injury.</p>	<p>Heavy, heat-proof gauntlets should be worn to handle the boiling tube if necessary to do so.</p>	2	2	4
<p>The tube may crack during the process, releasing its contents below.</p>	<p>The reaction must be carried out above ceramic mats. If the tube fails in this way, the contents should be allowed to burn out and cool in situ.</p>	2	2	4
<p>The blowtorch/Bunsen creates a fire hazard.</p>	<p>The blowtorch/Bunsen must only be used by people completely familiar with their correct use. The flame must only be on for as long as necessary. In particular in the case of the blowtorch, the gas must be switched off as soon as the potassium chlorate is ready, and before adding the jelly baby to the tube.</p>	3	2	6
<p>Working with Potassium Chlorate</p> <p>Potassium Chlorate is an oxidizer, UN1485 therefore precautions must be taking according to the MSDS: https:// education.scichem.com/ /Downloads/ DSP0030.pdf</p>	<p>Gloves and Goggles will warn when dispensing the potassium chlorate into the test tube. In addition it will be kept away from food. With hands washed before food consumption.</p>	2	3	6



	<p>Storage and Transport of Potassium Chlorate</p>	<p>Potassium Chlorate will be stored and transported always accompanied by the MSDS and will be stored and transported as advised within.</p> <p>Therefore the following precautions will be taken:</p> <ol style="list-style-type: none"> 1. It will be sourced from a reputable supplier 2. It will be stored and transported within a hermetically sealed container. 3. The container will be labelled with the chemical name (Potassium Chlorate) and the appropriate Hazchem 4. It will always be stored and transported in weights of 1kg or less 5. Transport by Land and Sea required no special conditions is quantity is kept to 1kg or below. 6. It will be stored in a cool, dry, well-ventilated area. And kept away from sources of heat, radiation, static electricity and food. 	2	3	6
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PPE Requirements

Item		Item		Item		Item	
Flameproof overalls		Gloves contact	Y	High visibility		Waterproof clothing	
Hardhat		Dust Mask		Gloves chemical		Wellington boots	
Hearing protection		Mask chemical vapour/ mist		Safety shoes			
		Laboratory Coat		Eye protection	Y		

Demonstration: Floating water trick

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	



Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
Two glass jars are filled with water and then a piece of paper is placed over the end. The jars are then held upside down and the paper remains stuck to the glass.	Cutting/stabbing hazard from sharp edge of cut lid of jar.	Presenter to warn volunteer of sharp edge of jar lid and to instruct volunteer not to touch it.	2	2	4
	Slip on wet floor caused by the water jar demo	Jar demo to be done over a larger container to contain water. All spillages to be mopped up immediately.	3	1	3

Demonstration: Tyndall's light fountain



Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y				

Activity	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
Water is poured into a bucket with hole low down on one side. The hole is taped up so that the bucket, temporarily, holds water. The tape is then removed, so that the water drains from the bucket in a single stream into another container. While this is happening a torch is shone into the bucket; the light is conducted through the stream of water in a curve.	Water may be spilled on the floor, creating a slip-hazard.	<p>The demonstration should be supervised by someone experienced with the demo, who understands how it behaves and how best to ensure that water is not spilt.</p> <p>Any water spilled on the floor should be well wiped/mopped up as soon as possible. Another receptacle will be placed below the bucket to catch the flowing water.</p> <p>This demonstration will be conducted away from electrical items and floor based plug sockets</p>	3	2	6

PPE Requirements

Item	Item	Item	Item
Flameproof overalls	Gloves contact	High visibility	Waterproof clothing
Hardhat	Dust Mask	Gloves chemical	Wellington boots
Hearing protection	Mask chemical vapour/mist	Safety shoes	
	Laboratory Coat	Eye protection	



Demonstration: Phone book tug-of-war

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Activity	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
Two books (product catalogues) have their pages interleaved, in a way that makes it very difficult to separate them simply by pulling. The books have reinforced spines, with chains and ropes attached so that two teams of volunteers can have a tug-of-war, to try and pull the books apart.	Volunteers may sustain injury through falling during the tug-of-war, for instance, if a member of the other team suddenly lets go, or if a volunteer loses grip on the rope.	<p>The presenter and assistants will be on hand to act as catchers in the event that any of the volunteers suddenly fall backwards. First aid trained staff should be on hand, in the unlikely event that injury is sustained.</p> <p>In addition the volunteers will be instructed to not pull each other and to concentrate on working together rather than as if they are separate team (it's both teams against the books). Also they will be instructed to pull only (not wiggle the books from side to side).</p>	2	4	4
	Friction burns from rope.	The presenter should instruct the volunteers not to wrap the rope around their arms, which would increase the risk, and generally to manage and discourage risky and excessive tugging.	2	2	4

PPE Requirements

Item	Item	Item	Item
Flameproof overalls	Gloves contact	High visibility	Waterproof clothing
Hardhat	Dust Mask	Gloves chemical	Wellington boots
Hearing protection	Mask chemical vapour/ mist	Safety shoes	
	Laboratory Coat	Eye protection	

Demonstration: Hand Generator with Microdet

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk



<p>Hand cranked generator is used to build up a voltage which ignites a squib (microdet). This ignition of this microdet (an off-the-shelf pyrotechnic) causes a loud bang.</p>	<p>Strong Magnets: The magnet used here is extremely powerful. It will attract ferromagnetic objects very strongly, sufficiently to cause injury to body parts caught in the way. This can happen very suddenly and very rapidly. If two such magnets are allowed to come together, they may cause severe crushing injuries, especially to fingers, which may even be severed. Even if they fly together without trapping fingers they may shatter from the impact and project shards of magnet through the air.</p>	<p>The generator has been built by a respected prop builder and supplied to us with a full users' guide.</p> <p>During transport, storage and when not in use, the magnet will be aligned with the end plates which form the structure of the generator. That way they will stay in place and attract minimal extraneous material.</p> <p>It will also be ensured that the operator of the generator (presenter or volunteer) does not have any medical equipment on them that will be affected by strong magnetic fields. Others will be kept at a distance of 2m.</p>	3	3	9
	<p>Impact Injury: As the generator is weighty, it could cause damage is it falls</p>	<p>The generator will always be placed on a stable table away from the edge</p>	1	4	4
	<p>Lifting Injury: As the generator is weighty, lifting it could cause damage is not undertaken correctly</p>	<p>It will only be lifted by our presenters, all of which are trained in the correct (bending the knees) procedure.</p>	1	3	3
	<p>Squib (microdet) creates loud explosive noise and amount of shrapnel on ignition</p>	<p>All audience to be advised to cover their ears ahead of explosion. Those with sensitive hearing to be advised to leave the room. Presenter to wear ear defenders. Protective shield to go in front of squib to protect audience from cardboard pieces released from the shell.</p> <p>Audience to be at a minimum of 3 meters distance from squib.</p>	2	4	8



<p>Working with Microdets (pyrotechnics):</p> <p>Microdets (also known as squibs) are small pyrotechnics. Classification 1.4G (UN0431)</p> <p>http://www.lemaitreltd.com/p/Microdets/0zzjc%5B%5DyA98g</p> <p>http://www.lemaitreltd.com/includes/images/uploads/ecommerce/documents/SDS%20Flash%20Reports,%20Maroons%20and%20Microdets%20(2017)%20-%20u5n52btf.ksd.pdf</p> <p>They are small cardboard tubes filled with aluminium powder, magnesium powder and an oxidizer with a remote igniter.</p>	<p>Microdets to be sourced from a reputable supplier (Le Maitre). When handling Microdets, goggles are to be worn at all times and there will be no naked flames, smoking or eating within the immediate area.</p>	2	4	8
<p>Storage and Transporting Microdets:</p> <p>As microdets are classified as a pyrotechnics there are rules and regulations governing their storage and transport.</p> <p>http://www.legislation.gov.uk/ukxi/2014/1638/contents/made</p>	<p>Microdets are classified as category 1.4G (the second lowest - safest- there is).</p> <p>The law states that is NEC (net explosive content) is lower than 5kg then no licence is needed. We will always ensure that the NEC is well below this limit. Each microdet has a NEC of 0.15g, therefore we could need to carry over 30,000 of them to exceed this limit (we normally carry 24 as a maximum)</p> <p>Microdets will always be stored and transported within a corrected labelled (1.4G) UN box. They will be kept in a cool, dry location, away high temperatures, shock, static discharge, vibrations or other physical stresses that might result in a hazardous situation.</p>	2	4	8



	<p>Non-Standard Ignition System: As we are using a non-standard ignition system we need to take care to avoid premature ignition.</p>	<p>Premature ignition will be negated with the use of a 'circuit connecting system'. Until the button is pressed on this 'circuit connecting system', no connection will be made between the generator and the microdets and so no ignition will occur. The 'circuit connecting system' will be fitted with a turn key to ensure no unconscious ignition can occur.</p> <p>The procedure for firing the microdet will be as follows:</p> <ol style="list-style-type: none">1. Microdets will be positioned in laboratory clamp2. The 'circuit connecting system' will be attached onto the generator3. The microdet will be wired into one side of the generator (still a broken circuit in three places)4. Volunteers will be invited on stage5. With ear defenders on both the presenter and the volunteers the second wire from the microdots will be connected to the generator6. The key will be moved to the armed position7. The generator will be rotated and when fully ready the button on the 'circuit connecting system' will be depressed completing the circuit and igniting the microdots.8. The key in the 'circuit connecting system' is moved into the unarmed position. <p>IN THE EVENT OF A MISFIRE the following procedure will be followed:</p> <ol style="list-style-type: none">1. The audience will be instructed to keep their hands over their eyes	2	4	8
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	Disposing of Microdets	<p>Once fired the microdets can be disposed of in the normal rubbish.</p> <p>If a misfire occurs and the microdet doesn't fire, it will be disposed of according to advice from the supplier. Therefore it will be immersed in water for 24 hours (ensuring that they are sunk under the surface of the water) and that any paper tops so should be pieced so that the water can easily permeate the device. After which they can be disposed of in the normal rubbish.</p>	1	2	2
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PPE Requirements

Item		Item		Item		Item	
Flameproof overalls		Gloves contact		High visibility		Waterproof clothing	
Hardhat		Dust Mask		Gloves chemical		Wellington boots	
Hearing protection	Y	Mask chemical vapour/mist		Safety shoes			
		Laboratory Coat		Eye protection	Y		

Demonstration: Exploding Flour Tin

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	



Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
A tablespoon of cornflour is placed on the end of a pipe which is inserted into an empty tin can with a candle in. The lid is then tightly closed and air blown through the pipe. The air causes the cornflour is spread out and subsequently be lit by the candle. This lead to a fire ball within the paint tin, which shoots the lid of the tin into the air.	The ball of flame from the fire ball may burn the face or hands of the presenter	Presenter must wear eye protection and gloves and also ensure that they are below the level of the can and at sufficient distance from the can.	3	1	3
	The ball of flame presents a fire hazard to building, equipment and audience.	Ensure that the area around the demo is clear from all additional equipment and flammable objects. Ensure there is sufficient room (at least 2m) above the tin without any overhanging objects. Ensure the audience are at a minimum of 3 metres from the demo equipment.	1	4	4
	The open flame of the candle presents a fire hazard.	Presenter to ensure that the candle is only lit directly before the demo and that it is extinguished immediately after the demo is complete.	1	4	4



	<p>The lid from the tin presents a projectile hazard to audience and presenter.</p>	<p>The tin will be positioned in such a way that when the lid fires, it travels upwards and hence it will only be on descent that it poses a hazard.</p> <p>Presenter to ensure that there is sufficient space around the demo for the lid to fall down. Ensure the audience are at a minimum distance of 3 meters from the demo equipment.</p> <p>If it is performed under an angled ceiling it is to ensure that tin is position such that the flight of the lid will not be towards the audience.</p> <p>The audience will be warned to cover their faces if the lids does fall towards them. In addition the lid will be inspected periodic for sharp edges with any being sanded smooth or a new lid provided.</p>	2	1	2
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PPE Requirements

Item		Item		Item		Item	
Flameproof overalls		Gloves contact	Y	High visibility		Waterproof clothing	
Hardhat		Dust Mask		Gloves chemical		Wellington boots	
Hearing protection		Mask chemical vapour/mist		Safety shoes			
		Laboratory Coat		Eye protection	Y		



Demonstration: Exploding Flour Demo

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
A tablespoon of cornflour is placed on a shower head and then blown across the open flame of a blowtorch to create a short lasting ball of fire.	The ball of flame may burn the face or hands of the presenter	Presenter must wear eye protection and gloves and also to angle the shower head away from their face.	3	1	3
	The ball of flame presents a fire hazard to building, equipment and audience.	Ensure that the area around the demo is clear from all additional equipment and flammable objects. Ensure there is sufficient room (3m) above the flame without any overhanging objects. Presenter must angle the shower head away from audience and other equipment.	1	4	4
	The open flame of the blowtorch presents a fire hazard.	Presenter to ensure that the blowtorch is steadily placed on the table and that the flame is angled away from other equipment. The blowtorch must be turned off as soon as the demo is complete.	1	4	4



PPE Requirements

Item		Item		Item		Item	
Flameproof overalls		Gloves contact	Y	High visibility		Waterproof clothing	
Hardhat		Dust Mask		Gloves chemical		Wellington boots	
Hearing protection		Mask chemical vapour/mist		Safety shoes			
		Laboratory Coat		Eye protection	Y		

Demonstration: Electrolysis of water, with explosion

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk



<p>Using a mains-powered laboratory power supply, a small (<10V) DC voltage will be applied across two lead electrodes immersed in a jar of acidified water.</p> <p>This will electrolyse the water evolving hydrogen and oxygen gas. This gas will be collected as a stoichiometric mixture passed from the jar via a rubber tube. The apparatus will be allowed to run for at least 20 minutes before demonstration, to allow the products to completely displace the air initially in the jar. During this period the evolved gas will be allowed to bubble into a conical flask of water, and then to disperse into the atmosphere.</p> <p>The demonstration will involve collecting the explosive gas mixture in soap bubbles on someone's hand; either the presenter's or a volunteer's. The bubbles will then be ignited, using either a match or a splint lit from a candle. The bubbles will explode with a loud bang a very transient flame.</p>	<p>The mixture of gases is explosive in any quantity, and does not need ambient oxygen to react, just a source of ignition, no matter how slight.</p> <p>This gas, if confined, could cause the apparatus to explode.</p> <p>There is particular risk of flashback - the gases in the rubber tube igniting and flashing back to the jar.</p> <p>If the water in the conical flask becomes soapy (eg after repeated performances of the demo), the gas mixture may collect in bubbles which could ignite unexpectedly</p>	<p>No more than a few millilitres of the gas mixture should be allowed to accumulate anywhere. The jar must be kept nearly full so as to minimise the headspace inside, and <u>must be</u> sealed with a fail-safe closure (eg a bung) that will give way if necessary.</p> <p>The tube must be terminated with a nozzle containing a gauze or mesh to act as a flashback arrester. Nevertheless the tube must be kept away from sources of ignition, which will be present. This is especially important to consider when igniting the bubbles - this must not be done until the tube has consciously been held well clear.</p> <p>The gas mixture that is evolved before the demonstration is performed will be produced slowly, but must be allowed to disperse rather than accumulate anywhere. It is lighter than air, so will escape to the atmosphere from an open flask, and this must be allowed to happen. The water in the conical flask should not be allowed to become soapy, as this will cause the gas to accumulate in bubbles. If this does happen, be aware of the hazard and try to disperse the bubbles frequently.</p>	1	4	4
<p>The demonstration will involve collecting the explosive gas mixture in soap bubbles on someone's hand; either the presenter's or a volunteer's. The bubbles will then be ignited, using either a match or a splint lit from a candle. The bubbles will explode with a loud bang a very transient flame.</p>	<p>The explosion can be very loud, and is in close proximity to the presenter/volunteers.</p>	<p>The presenter ought to wear ear-defenders, especially if performing this demonstration repeatedly.</p> <p>Any volunteers used must be clearly warned about the noise and offered ear-defenders</p>	4	1	4
<p>As the hand will be damp from the water, the high specific heat</p>	<p>Volunteers will have washing-up liquid poured into their hands. It is possible that they might be sensitive/allergic.</p>	<p>Any volunteers must be warned (ideally before being selected) that they will have washing-up liquid applied to their hands, so that they can opt out if necessary. Gloves are not recommended.</p> <p>Paper towels must be available.</p>	2	1	2



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capacity of the water will prevent any excessive heat from the explosion being transmitted to the skin.	The water (electrolyte) in the jar is acidified with sulphuric acid, to a concentration that will irritate skin and be harmful to eyes.	The jar should be secured with a clamp and stand to help prevent it toppling. Eye protection is advised for presenter and necessary for volunteers.	3	2	6
	The apparatus includes several wires, including some attached to the electrolysis jar. These may pull on it if snagged.	All wires and cables must be carefully managed and taped wherever possible, and must not be allowed to pull on the apparatus.	2	2	4

PPE Requirements

Item		Item		Item		Item	
Flameproof overalls		Gloves contact	Y	High visibility		Waterproof clothing	
Hardhat		Dust Mask		Gloves chemical		Wellington boots	
Hearing protection	Y	Mask chemical vapour/ mist		Safety shoes			
		Laboratory Coat		Eye protection	Y		



Demonstration: Electrocuting a Gherkin

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Activity	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk



<p>A gherkin will be subjected to mains voltage, resulting in a strong electrical discharge through the body of the gherkin.</p>	<p>By necessity for the demonstration, there will be surfaces/contacts electrified to mains voltage, which are either completely exposed or not insulated/enclosed to the standard required by electrical regulations.</p> <p>This creates a significantly enhanced risk of mains electric shock to users of the apparatus and those nearby, which could cause injury or even death.</p>	<p>The electric circuit will contain a push-to-make switches which independently break the supply of the live phase – ie this switch needs to be held down in order to electrify any exposed contacts.</p> <p>The risk to people other than a single user of the apparatus is partly mitigated by this switch, in that they ensure that the circuit is only made when wanted, and is very unlikely to be accidentally or inadvertently connected. However, someone unaware of the hazard, could in principle try to touch the apparatus while in use. All present should therefore be made aware that they are not to approach the demonstration while it is in use.</p> <p>This demonstration must only be performed by presenters experienced with the apparatus, and who completely understand all the risks.</p> <p>The presenter will always assume that the apparatus is live unless the KNOW that it is safe.</p> <p>The apparatus will be checked before each use for damage and not used if any damaged is reported.</p> <p>If left unattended, the apparatus will; be unplugged.</p>	<p>2</p>	<p>3</p>	<p>6</p>
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	<p>It is not easy to determine how much current may be drawn by the apparatus while in use. This creates the possibility of blowing fuses or tripping RCDs in the mains supply.</p>	<p>The possibility of an excessively high current being drawn will be eliminated by using a resistor wired in series with the rest of the circuit. This resistor will be in the form of a domestic kettle – which is ideal in that it will pass a high enough current for the demonstration to work well, but cannot not pass any more than it would in normal operation, and will also dissipate any excess heat very effectively.</p>	2	2	4
	<p>The demonstration may give off some smoke.</p>	<p>Smoke detectors in the vicinity of the demonstration should be turned off where possible, or other steps taken to ensure that the fire alarms are not activated by smoke.</p>	4	1	4

PPE Requirements

Item		Item		Item		Item	
Flameproof overalls		Gloves contact		High visibility		Waterproof clothing	
Hardhat		Dust Mask		Gloves chemical		Wellington boots	
Hearing protection		Mask chemical vapour/ mist		Safety shoes			
		Laboratory Coat		Eye protection			



Demonstration: Carbon Arc Lamp

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Activity (Method Statement)	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
The mains electricity supply will be passed across the gap between two carbon electrodes, creating an electrical arc which will emit lots of light.	<p>By necessity for the demonstration, there will be surfaces/ contacts electrified to mains voltage, which are either completely exposed or not insulated/enclosed to the standard required by electrical regulations.</p> <p>This creates a significantly enhanced risk of mains electric shock to users of the apparatus and those nearby, which could cause injury or even death.</p>	<p>The apparatus will be unplugged and stored away from access at all times, other than immediately as being demonstrated. Only the presenter and assistants will handle the apparatus, or go near it while any plugged in. The presenter must have experience with the apparatus and know how to handle it. He or she will immediately unplug it and make it safe after presenting it.</p> <p>In addition the presenters will be given full training in how to use the apparatus, along with a compressive manual for reference at a later date.</p>	2	4	8



	<p>The electric arc will emit a small amount of UV radiation, which may be harmful to eyes with prolonged (yet short) exposure.</p>	<p>The arc will only be displayed briefly, so exposure to UV radiation will be slight. Nevertheless a polycarbonate safety screen will shield the apparatus, which will absorb the majority of the radiation.</p> <p>Audience will also be warned about the brightness, and asked not to stare at the arc.</p> <p>The presenters will wear welding goggles and sunscreen.</p>	5	1	5
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PPE Requirements

Item	Item	Item	Item	
Flameproof overalls	Gloves contact	High visibility	Waterproof clothing	
Hardhat	Dust Mask	Gloves chemical	Wellington boots	
Hearing protection	Mask chemical vapour/ mist	Safety shoes	Sunscreen	Y
	Laboratory Coat	Eye protection	Y	

Demonstration: Alka seltzer rockets

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk



<p>Small containers are filled with a small amount of water and then an alka seltzer tablet is added and the container sealed.</p> <p>The alka seltzer reacts with the water to produce carbon dioxide gas, as this builds up eventually there will be enough pressure to fire the container into the air.</p>	<p>The container go into the air and presents a striking hazard to people or furniture. Once the containers land they may be a trip hazard.</p>	<p>Ensure all participants who load the containers step back from the launch zone.</p> <p>The containers are so light that if they do contact people (anywhere but the eye) they will not cause damage. The audience will be instructed that if the containers do come towards them to look away and protect their face.</p>	2	1	2
	<p>Water from the demonstration is a potential slip hazard</p>	<p>All spillages to be wiped up as soon as possible.</p>	1	2	2
	<p>The chemicals in the alka seltzer are toxic if consumed in large quantities.</p>	<p>Warn adults not to drink contents of the bottles or to consume alka seltzer tablets</p>	1	1	1

PPE Requirements

Item	Item	Item	Item
Flameproof overalls	Gloves contact	High visibility	Waterproof clothing
Hardhat	Dust Mask	Gloves chemical	Wellington boots
Hearing protection	Mask chemical vapour/ mist	Safety shoes	
	Laboratory Coat	Eye protection	Y

Demonstration: Large electromagnet :

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
A large electromagnet is connected to power supply. Two volunteers attempt to separate the electromagnet while it is switched on.	By necessity for the demonstration, there will be surfaces/ contacts electrified to stored voltage, which are either completely exposed or not insulated/enclosed to the standard required by electrical regulations. This creates a small possibility of electric shock.	The apparatus will be unplugged and stored away from access at all times, other than immediately as being demonstrated. Only the presenter and assistants will handle the apparatus, or go near it while any plugged in. The presenter must have experience with the apparatus and know how to handle it. The magnet is an off-the-shelf product designed for such demonstrations. Most of the electromagnet used are simply powered by a 9volt battery therefore the harm caused by a rare shock will be minimal.	2	2	4
	The volunteers may fall over once the electromagnet is turned off.	Warn volunteers to be aware that they may fall backwards. Ensure the area behind the volunteers is clear so that they have enough space to move around without tripping or falling.	4	1	4

PPE Requirements

Item	Item	Item	Item
Flameproof overalls	Gloves contact	High visibility	Waterproof clothing
Hardhat	Dust Mask	Gloves chemical	Wellington boots
Hearing protection	Mask chemical vapour/ mist	Safety shoes	
	Laboratory Coat	Eye protection	

Demonstration: Van De Graaff Generator with Barbie and Pie Dishes

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
A van de graaf generator is used by the presenter to create some sparks. Then in turn a Barbie doll and then some (approx. an 8cm high pile) small metal pie dishes are placed on the large dome of the van de graaf generator and the van de graaf is switched. The hair of the Barbie doll will become separated and the pie dishes will all gracefully fly off.	Electrical fault	Ensure van de Graaff is in fully working order. The Van de Graaff will either be brand new (less than 6months old), or will be PAC tested.	1	1	1
	Trip hazard	If the wires are trailing over the stage they will be secured with gaffer tape.	1	1	1
	Static Shock	Only the presenter will be on stage when the Van de Graaf is switched on. All the presenters are fully trained in how to use a Van de Graaff generator and will ensure that the earthing globe/ earthing wires are used when necessary. They have no heart conditions that prevent them from using such equipment.	3	1	3
	Working with High Voltage Apparatus	As this machine uses high voltage it should not be used near those with pace makers or other electrical based health monitors, therefore the audience will be warned that if they do have a pacemaker to stand back at least 3metres	1	5	5

PPE Requirements

Item	Item	Item	Item
Flameproof overalls	Gloves contact	High visibility	Waterproof clothing
Hardhat	Dust Mask	Gloves chemical	Wellington boots
Hearing protection	Mask chemical vapour/ mist	Safety shoes	
	Laboratory Coat	Eye protection	



Demonstration: Cinnamon Taste Test

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
Volunteers are asked to pinch nose and place a small amount of cinnamon in their mouths. They are then instructed to release their noses. Once they release their noses they will be able to taste the cinnamon much more.	Volunteers may have allergic reaction to cinnamon.	Presenter must clearly ask volunteers if they have any food allergies. Those with allergies are not allowed to take part.	1	3	3
	Volunteers may swallow too much cinnamon which would make them feel unwell	Presenter must clearly instruct volunteers to only take a small amount of cinnamon to taste.	2	1	2
	The unpleasant taste of cinnamon may cause nausea for some, or cause choking.	Have drinking water on hand to wash out mouth	1	1	1

PPE Requirements

Item		Item		Item		Item	
Flameproof overalls		Gloves contact		High visibility		Waterproof clothing	
Hardhat		Dust Mask		Gloves chemical		Wellington boots	
Hearing protection		Mask chemical vapour/ mist		Safety shoes			
		Laboratory Coat		Eye protection			

Demonstration: PTC Taste Test

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
Six or more volunteers are selected from the audiences as asked to place two differing strips of paper on their tongues. One strip is simply a control (a plain strip of paper). The other strip is one that	The volunteers may inadvertently swallow the pieces of paper and lead to choking hazard	Presenter must clearly instruct volunteers to place paper on the tongue without closing their mouths. Provide container for volunteers to throw away used pieces of paper.	3	1	3
	The unpleasant taste of PTC may cause nausea for some.	Have drinking water on hand for those who may find the taste particular unpleasant.	1	3	3



<p>is impregnated with PTC (Phenylthio Carbamide). Both strips can be seen here:</p> <p>https://www.brecklandscientific.co.uk/HHE-250-100-p/hhe-250-100.htm</p> <p>http://www.brecklandscientific.co.uk/HHE-250-250-p/hhe-250-250.htm</p>	<p>Cross contamination of paper with germs from presenter.</p>	<p>Presenter to wear gloves at all times while handling the PTC or/and to use tweezers when transferring PTC pieces to volunteers.</p>	<p>2</p>	<p>2</p>	<p>4</p>
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PPE Requirements

Item	Item	Item	Item
Flameproof overalls	Gloves contact	High visibility	Waterproof clothing
Hardhat	Dust Mask	Gloves chemical	Y Wellington boots
Hearing protection	Mask chemical vapour/mist	Safety shoes	
	Laboratory Coat	Eye protection	

Demonstration: Plasma Ball

Those at risk (please tick)	Ri Staff	Contractors	Tenants	Visitors	Others
	Y			Y	

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk



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An off-the-shelf plasma ball is turned off with the lights down. By placing your hand near the plasma ball you encourage the sparks to travel towards your hands. Next a fluorescent tube is placed near or one the plasma ball and it causes the tube to light up even though it is not plugged in.	Electrical fault	Ensure the plasma ball is in fully working order. The Plasma Ball will be off-the-shelf and designed for this purpose. It will either be brand new (less than 6months old), or will be PAC tested.	1	1	1
	Trip hazard	If the wires are trailing over the stage they will be secured with gaffer tape.	1	1	1
	Electric Shock	The plasma ball is designed for this purpose. There is minimal risk of electric shock if the ball remains intact whilst plugged in. If the ball breaks, switch off immediately and dispose of ball.	1	1	1
	Cut Injury	If the plasma ball breaks it may reveal sharp edges. If this happens the sharps will be wrapped in tissue and disposed of in the normal rubbish. Or if a sharps bin is available that will be used instead.	1	2	2

PPE Requirements

Item		Item		Item		Item	
Flameproof overalls		Gloves contact		High visibility		Waterproof clothing	
Hardhat		Dust Mask		Gloves chemical		Wellington boots	
Hearing protection		Mask chemical vapour/ mist		Safety shoes			
		Laboratory Coat		Eye protection			