

Demonstration Risk Assessment Form

SCIENCE IN SCHOOLS- EXPLOSIVE FOOD SHOW
APRIL 2021

This 50-60min long show contains the following demonstrations:

1. Burning Jelly Babies
2. Cinnamon Taste Test
3. PTC Test
4. Jumping
5. Bread Man
6. Flour Fireball
7. Digestive System
8. Mentos and Coke
9. Flour Paint Tin

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:

1. Isolate Smoke/ Fire Alarms in vicinity of demonstrations
2. Ensure 1 x Fire Extinguisher is on Stand-by (only to be used in emergencies- should be either dry powder, carbon dioxide or water spray (not jet))
3. Ensure presenter knows Fire Evacuations procedures
4. Ensure presenter knows location of nearest fire extinguishers
5. To inform presenter/ Ri (at least 24hr prior to performance time) if any of the attendees suffer allergies to latex

Risk assessed by: Fran Scott

Date of last review: 15/04/2021

Demonstration: Burning Jelly Baby

Those at risk (please tick)	Ri Staff	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y		Y		

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
<p>Approximately 5-6 spatula fulls of potassium chlorate, an oxidizing agent, is placed into a boiling tube in a laboratory clamp and stand. It is then melted and heated close to its boiling point with a blowtorch.</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> <p>The blowtorch/ portable Bunsen used will be fueled with either Butane or a high temperature gas mix (MAP gas).</p> <p>To save the safety screen needing frequent replacing, cheaper acrylic 'inserts' will be provided which can be attached onto the safety screen via clips.</p> <p>(note- when referring to butane it also applies to</p>	Eye injury via multiple possible causes.	Eye protection must be worn throughout.	1	4	4
	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.	The demonstration should be performed only in a well-ventilated environment and with audience members well clear (at least 3 metres).	4	1	4
	The smoke may also set off fire alarms.	Smoke detectors in the same room should be isolated from the fire alarm system if possible			
	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.	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.	2	3	6
	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.				
	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.				
	As the jelly baby burns a flame is produced from the boiling tube	Tongs/ tweezers will be used to drop the jelly baby into the tube. In addition, the boiling tube will be angled slightly such that the jelly baby slides into the potassium chlorate, giving time for the presenter's hand to clear the area.	2	2	4
		Heat proof gloves are also to be used for inserting the Jellybaby, unless the gloves			



a butane/ propane mix)		compromise dexterity, in which case they would add more risk (this is presenter dependent).			
	The tube will become extremely hot (around 400°C or more) it will remain hot for some time after the demonstration, risking burning injury.	Heavy, heat-proof gauntlets should be worn to handle the boiling tube if necessary to do so.	2	2	4
	The tube may crack during the process, releasing its contents below.	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. If the power drops whilst still in powder form, carefully gather up and place in another boiling tube and burn off using another jelly baby.	2	2	4
	The blowtorch/Bunsen creates a fire hazard.	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.	3	2	6
	Working with Potassium Chlorate Potassium Chlorate is an oxidizer, UN1485 therefore precautions must be taking according to the MSDS: https://www.timstar.co.uk/media/wysiwyg/Insights_Lab/SDS/timstar_chemical_sds_PO4840.pdf	Nitrile 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.	2	3	6
	Storage and Transport of Potassium Chlorate	Potassium Chlorate will be stored and transported accompanied by the MSDS (digital version acceptable) and will be stored and transported as advised within. Therefore, the following precautions will be taken: 1. It will be sourced from a reputable supplier 2. It will be stored and transported within a sealed container separate to fuel sources, mostly the one it is	2	3	6



		<p>supplied in. Good practice is to seal this lid with tape after each use.</p> <ol style="list-style-type: none">3. The container will be labelled with the chemical name (Potassium Chlorate) and the appropriate Hazchem4. It will always be stored and transported in weights of 1kg or less (mostly even less than 500g will be transported and stored)5. Transport by Land and Sea required no special conditions if 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.7. As a further precaution it will be 'double' boxed i.e kept in a box within a box such that if a spill occurs in the first, the second will catch the spill. Ideally, this box will be lockable, so if left unattended the potassium chlorate cannot be accessed by others.			
	Disposing of Used Potassium Chlorate	The ratios used in this reaction are such that the chlorate will have reacted with the jelly baby and so after the reaction has occurred the boiling tube can be disposed off in the normal domestic rubbish	1	1	1
	Working with Butane or Butane/ Propane mix The gas used will be from domestic canisters: UN 2037 Safety data sheets can be found here; Butane: http://www.farnell.com/datasheets/1801831.pdf Butane/ Propane mix: http://www.partinfo.co.uk/files/2500%20Cartridge.pdf	<p>The butane used is available domestically, it is used as a lighter refill, however it should still be treated with respect. It will be sourced from a reputable supplier and canisters inspected for damage before use. Goggles will be worn when using the blowtorch</p> <p>Butane can be extinguished using either water spray, dry powder or carbon dioxide extinguishers, though these will only be used in an emergency, with oxygen restriction being used as our preferred method.</p>	1	4	4
	Storing and Transporting Butane	It will be stored in a non-conductive box at a temperature below 50°C and away from			



	and Butane/ Propane mix	<p>sources of ignition.</p> <p>There will be a maximum of 8 canisters stored at one point, but mostly only 4, unless a high number of shows are needed.</p> <p>Due to the butane being domestic canisters and the small volume carried/ stored no special license or labelling is needed.</p> <p>Ideally the box containing the butane will be lockable, so if left unattended the gas cannot be accessed by others.</p>	1	3	3
	Working with Propylene/ MAP gas (High Temperature Gas Mix) UN1077 Safety data sheet can be found here; https://www.tooled-up.com/artwork/ProdPDF/2599.pdf	<p>The gas mix used is available domestically (from DIY shops) however it should still be treated with respect. It will be sourced from a reputable supplier and canisters inspected for damage before use and transport. The head of the blow torch will always be removed from the bottle for storage and transport.</p> <p>Googles will be worn when using the lit blow torch.</p> <p>High temperature gas mix can be extinguished using dry chemical powder, Carbon dioxide (CO₂), Water fog or Foam. Do not use water jet as an extinguisher.</p> <p>The presenter is to ensure that they are not charged (if electrostatic demonstration have been conducted) before handling the gas, earthing themselves if necessary.</p> <p>The blow torch will only be used in a well-ventilated area. If this is not possible, then it will only be used for the shortest time possible, with the butane torch being used for the demonstrations it can be.</p>	1	4	4
	Storing and Transporting Propylene/ MAP gas (High Temperature Gas Mix)	<p>Ideally the canisters will be stored in a non-conductive box and at temperatures not exceeding 49°C/120°F. They will be kept in a cool, dry place out of direct sunlight and away from heat, sparks and open flames.</p> <p>Empty canisters will not be pierced and will be returned to the Ri for appropriate</p>	1	4	4



		disposal. Ideally the box containing the propylene will be lockable, so if left unattended the gas cannot be accessed by others.			
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PPE Requirements

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

Demonstration: Cinnamon Taste Test

Those at risk (please tick)	Ri Staff	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y	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 of volunteers if necessary.	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	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y	Y	Y		

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
<p>Six or more volunteers are selected from the audience and asked to place two differing strips of paper on their tongues, one at a time. One strip is simply a control (a plain strip of paper). The other strip is one that is impregnated with PTC (Phenylthio Carbamide).</p> <p>Both strips can be seen here: https://www.brecklandscientific.co.uk/HHE-250-100-p/hhe-250-100.htm http://www.brecklandsscientific.co.uk/HHE-250-250-p/hhe-250-250.htm</p>	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 or volunteers to place straight into a provided bin.	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
	Cross contamination of paper with germs from presenter.	Presenter to wear gloves at all times while handling the PTC or/and to use tweezers when transferring PTC pieces to volunteers.	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: Jumping

Those at risk (please tick)	Ri Staff	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y	Y	Y		

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
A member of the audience is brought onto stage as a volunteer. The rest of the audience stands (if they are able to) and are instructed to jump 10 times by the volunteer.	Exertion injury	The presenter will verbally warn the audience to only stand if they are able. If performed on the tiered seating area verbal warnings will be given to be careful about where they feet fall and, if necessary, instructed to not jump very high.	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: Bread Man/ Burning Bread

Those at risk (please tick)	Ri Staff	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y	Y	Y		

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
<p>Either a piece of bread or a piece of bread shaped into a person (using a cookie cutter) is attempted to be burnt using a blowtorch.</p> <p>The blowtorch will be fueled by either butane or a high temperature gas mix.</p> <p>(note- when referring to butane it also applies to a butane/ propane mix)</p>	Fire hazard	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. A fire extinguisher will be on stand-by	2	2	4
	Burn	The piece of bread will be held in a gloved hand (heat proof gloves) and held with tongs.	2	3	6
	<p>Working with Butane or Butane/ Propane mix</p> <p>The gas used will be from domestic canisters: UN 2037</p> <p>Safety data sheets can be found here;</p> <p>Butane: http://www.farnell.com/datasheets/1801831.pdf</p> <p>Butane/ Propane mix: http://www.partinfo.co.uk/files/2500%20Cartridge.pdf</p>	<p>The butane used is available domestically, it is used as a lighter refill, however it should still be treated with respect. It will be sourced from a reputable supplier and canisters inspected for damage before use. Goggles will be worn when using the blowtorch</p> <p>Butane can be extinguished using either water spray, dry powder or carbon dioxide extinguishers, though these will only be used in an emergency, with oxygen restriction being used as our preferred method.</p>	1	4	4



	Storing and Transporting Butane and Butane/ Propane mix	<p>It will be stored in a non-conductive box at a temperature below 50°C and away from sources of ignition.</p> <p>There will be a maximum of 8 canisters stored at one point, but mostly only 4, unless a high number of shows are needed.</p> <p>Due to the butane being domestic canisters and the small volume carried/ stored no special license or labelling is needed.</p> <p>Ideally the box containing the butane will be lockable, so if left unattended the gas cannot be accessed by others.</p>	1	3	3
	Working with Propylene/ MAP gas (High Temperature Gas Mix) UN1077 Safety data sheet can be found here; https://www.tooled-up.com/artwork/ProdPDF/2599.pdf	<p>The gas mix used is available domestically (from DIY shops) however it should still be treated with respect. It will be sourced from a reputable supplier and canisters inspected for damage before use and transport. The head of the blow torch will always be removed from the bottle for storage and transport.</p> <p>Googles will be worn when using the lit blow torch.</p> <p>High temperature gas mix can be extinguished using dry chemical powder, Carbon dioxide (CO₂), Water fog or Foam. Do not use water jet as an extinguisher.</p> <p>The presenter is to ensure that they are not charged (if electrostatic demonstration have been conducted) before handling the gas, earthing themselves if necessary.</p> <p>The blow torch will only be used in a well-ventilated area. If this is not possible, then it will only be used for the shortest time possible, with the butane torch being used for the demonstrations it can be.</p>	1	4	4
	Storing and Transporting Propylene/ MAP gas (High Temperature Gas Mix)	Ideally the canisters will be stored in a non-conductive box and at temperatures not exceeding 49°C/120°F. They will be kept in a cool, dry place out of direct sunlight and away from heat, sparks and open flames.	1	4	4



		<p>Empty canisters will not be pierced and will be returned to the Ri for appropriate disposal.</p> <p>Ideally the box containing the propylene will be lockable, so if left unattended the gas cannot be accessed by others.</p>			
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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: Flour Fireball

Those at risk (please tick)	Ri Staff	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y		Y		

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
<p>A tablespoon or two of cornflour is placed on a shower head/ funnel connected to a pipe. This cornflour is then blown upwards through the open flame of a blowtorch to create a short-lasting ball of fire.</p> <p>The blowtorch will be fueled by butane or a butane/ propane mix.</p>	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 if the blowtorch is placed on the table it is in a stable position. And also ensure 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
	Working with Butane or Butane/ Propane mix The gas used will be from	The butane used is available domestically, it is used as a lighter refill, however it should still be treated with respect. It will be sourced from a reputable supplier and	1	4	4



	<p>domestic canisters: UN 2037</p> <p>Safety data sheets can be found here;</p> <p>Butane: http://www.farnell.com/datasheets/1801831.pdf</p> <p>Butane/ Propane mix: http://www.partinfo.co.uk/files/2500%20Cartridge.pdf</p>	<p>canisters inspected for damage before use. Googles will be worn when using the blowtorch</p> <p>Butane can be extinguished using either water spray, dry powder or carbon dioxide extinguishers, though these will only be used in an emergency, with oxygen restriction being used as our preferred method.</p>			
	<p>Storing and Transporting Butane and Butane/ Propane mix</p>	<p>It will be stored in a non-conductive box at a temperature below 50°C and away from sources of ignition.</p> <p>There will be a maximum of 8 canisters stored at one point, but mostly only 4, unless a high number of shows are needed.</p> <p>Due to the butane being domestic canisters and the small volume carried/ stored no special license or labelling is needed.</p> <p>Ideally the box containing the butane will be lockable, so if left unattended the gas cannot be accessed by others.</p>	1	3	3

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: Digestive System

Those at risk (please tick)	Ri Staff	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y	Y	Y		

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
Various foods are cut up with scissors into a bowl and mixed with coffee. They are then mashed together. First liquid and soap are added. This is transferred to a plastic bag where vinegar and food colour are added. This is then transferred to tights which are squeezed to remove liquid. The final result is squeezed into another bowl	Slip on wet floor caused by the spillages from mixture	All spillages to be wiped up at the earliest convenience, with verbal warning given in the meantime.	1	2	2
	Risk to electrical equipment being damaged by liquid	Ensure demo is carried out away from other equipment and all spillages are cleaned up at the earliest convenience	1	4	4
	Cutting/ stabbing hazards from sharp edge of scissors	Either safety scissors will be used, or those using the scissors will be closely supervised during usage.	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		
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Demonstration: Mentos Fountain

Those at risk (please tick)	Ri Staff	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y	Y	Y		

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
A tube of mentos mints are loaded into a boiling tube with a card over the opening of the tube. The tube upturned into a bottle of cola, with all the mints falling into the drink. This causes a built up of gas within the bottle, leading to a fountain of cola escaping from the bottle.	Slip on wet floor caused by the spillages from soda liquid	All spillages to be cleaned up at the earliest convenience. The demonstration will also be conducted within a plastic box which should catch most of the liquid from the reaction. Diet drinks will be used in preference to full sugar versions to prevent the build-up (and stickiness) of sugar residue.	1	2	2
	Risk to electrical equipment being damaged by liquid	Ensure demo is carried out away from other equipment and all spillages are mopped up at the earliest convenience.	1	4	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: Exploding Flour Tin

Those at risk (please tick)	Ri Staff	On-Stage Volunteers	Audience	Non-Ri Workers	Others
	Y		Y		

Method Statement	Hazards	Mitigation	Likelihood	Severity of impact	Current Risk
<p>A tablespoon or two of cornflour is placed on the end of a shower head/ funnel which is inserted into an empty tin can with a number of candles in. The candles are lit and then the lid is tightly closed. Air blown through the pipe. The air causes the cornflour to be spread out and subsequently be lit by the candle. This leads to a fireball within the paint tin, which shoots the lid off the tin and into the air.</p>	<p>The ball of flame from the fire ball may burn the face or hands of the presenter</p>	<p>Presenter must wear eye protection and ensure that they are below the level of the can and at sufficient (0.5M) distance from the can. Heat proof gloves can also be warned if they do not compromise dexterity.</p>	3	1	3
	<p>The ball of flame presents a fire hazard to building, equipment and audience.</p>	<p>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.</p>	1	4	4



	The open flame of the candles presents a fire hazard.	Presenter to ensure that the candles are only lit directly before the demo and that they are extinguished immediately after the demo is complete (they tend to be put down automatically during the demonstration)	1	4	4
	The lid from the tin presents a projectile hazard to audience and presenter.	<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 be ensured that tin is positioned 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 for sharp edges with any being sanded smooth or a new lid used.</p>	2	1	2

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		