UNIVERSITY OF BIRMINGHAM

GENERAL HEALTH AND SAFETY RISK ASSESSMENT FORM

Site	**Various**	**Department**	**School of Metallurgy and Materials**	**Version / Ref No.**	**1**
Activity Location	**At a variety of schools (run by teachers)**	**Activity Description**	'Lets Move to the Moon' project is a variety of missions for which the equipment is included in a case which is left with a school for 6-8 weeks and the teacher/ session leader runs each session ('mission') with their group or students. See proformas for each mission in **Appendix 1**		
Assessor	**Chris Hamlett**	**Assessment Date**	**20/10/2022**	**Date of Assessment Review**	**20/10/2023**
Academic / Manager Name	**Alessandro Mottura / Irina Hoffman**	**Academic / Manager Signature**			

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 S	L	R	Are these adequate? Yes/No	Changes to/ Additional Controls	Residual Risk Rating S	L	R	Owner	Due Date	Action Complete
Venue risk assessment:															
Venue specific risks	• Session leader not appreciating risks •Inappropriate choice of location for missions to take place	Session leader(s) (e.g. teacher and support staff) Participants (e.g. school students) Ambassadors (volunteers from Discover Materials)	• By the students misusing the equipment in the mission case • By inappropriate locations being chosen for the missions to be carried out (e.g. mission 6 being carried out in a room with a low ceiling which could cause ceiling damage)	• The session leader (probably a teacher) will be briefed on the safety precautions associated with the missions and a copy of this Risk Assessment left with them. • An overview of the risks for each mission will be included in the mission booklet that each participant will have in advance of carrying out the mission. • The risk assessment should be sent to the teacher / session leader in advance of the case being delivered • The teacher / session leader will be expected to follow any local safety guidance.	3	1	3	Yes							
Activity specific risks assessment:															
Impact injury *Missions 1, 3, 6 and 7*	• Dropping the bars of different materials (Missions 1 and 3) • Being hit by a flying film cannister (mission 6) • Being hit by a flying 3D printed rocket (mission 7)	Session leader(s) (e.g. teacher and support staff) Participants (e.g. school students)	**Mission 1 and 3** Handlers may drop the bars of material which may then drop onto their foot (or strike another body part) **Mission 6 and 7** The fizzy vitamin C powered flying rocket (film cannister in mission 6) or foot pump powered 3D printed rocket in Mission 7) may	**Mission 1 and 3** • The bars of materials are only 25cm long and so are not too heavy. • The participants will be warned of the heavier ones (iron) • The session leader will ask the participant before handing them the bar and, if deemed necessary, help the participant by helping to support the bar. **Mission 6** • A launch zone should be set up the perimeter of which should be at least 2.5m from the launch pad	1	2	2	Yes							

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 S	L	R	Are these adequate? Yes/No	Changes to/ Additional Controls	Residual Risk Rating S	L	R	Owner	Due Date	Action Complete
			hit the demonstrator or audience member	• The activity should be carried out outside or in a room with very high ceilings (such as a school hall). • The launch must take place from a flat surface (such as table top or a tray) *Demonstrator (person who sets off the rocket)* • Ensure that the demonstrator is wearing eye protection • Do not look directly down onto the rocket once the vitamin c tablet and water has been sealed in by the lid • If returning to the rocket approach it cautiously as it might set off *Audience* • The audience must not enter the launch zone • Pay attention and be prepared to duck out of the way of a flying rocket	2	2	4	Yes							
				Mission 7 • A launch zone should be set up with the audience at least 5m from the launch pad • The activity should be carried out outside • The launch must take place from a flat surface (such as table top or a tray) *Demonstrator (person who sets off the rocket)* • The demonstrator is trained in advance of the session in pressurising and launching the rocket • Ensure that the demonstrator is wearing eye protection • Do not over pressurise the rocket *Audience*	2	2	4	Yes							

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 S	L	R	Are these adequate? Yes/No	Changes to/ Additional Controls	Residual Risk Rating S	L	R	Owner	Due Date	Action Complete
				• The audience must not enter the launch zone • Pay attention and be prepared to duck out of the way of a flying rocket											
Cuts *Missions 1, 2 and 5*	Sharp edges caused by machining of the materials bars, broken ruler or glassware	Session leader(s) (e.g. teacher and support staff) Participants (e.g. school students)	Cutting fingers on any sharp edges that may remain near the top of the bars due to them being cut from larger bars / pipes, (mission 1) If the ruler (metal or plastic) is broken (mission 2) or if the Kilner jar smashes broken glass will be present (mission 5)	**Mission 1:** • Be careful of any sharp edges when handling bars / pipes **Mission 2:** • Be careful of sharp edges if the ruler breaks in mission 2. **Mission 5:** • Take care when using the pump to evacuate the Kilner jar • Clear up any broken glass with a dustpan and brush immediately • Inspect the jar before use, do not use if there are signs of cracking	2	1	2	Yes							
Slips *Mission 4*	•Loose UV colour-changing beads •Spilled liquid	Session leader(s) (e.g. teacher and support staff) Participants (e.g. school students)	**Mission 4** • Slipping on spiled UV colour changing beads **Mission 6** • Liquid rocket fuel (water and vitamin C table) will be spilled after the film cannister launch.	**Mission 4** • Keep the UV-colour changing beads in a sealed, plastic petri dish • Sweep up any loose beads if the petri dish break **Mission 6** • The rocket launch should take place in a spill tray (e.g. baking tray) • The liquid rocket fuel (water / vitamin C tablet) should be mopped up immediately, using absorbent paper towel and discarded in the waste bin	2 2	1 1	2 2	Yes Yes							

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 S	L	R	Are these adequate? Yes/No	Changes to/ Additional Controls	Residual Risk Rating S	L	R	Owner	Due Date	Action Complete
Eye damage Missions 3 and 4	• UV torch • Red light laser on IR thermometer	Session leader(s) (e.g. teacher and support staff) Participants (e.g. school students)	• By shining the UV torch or IR thermometer into people's eyes	**Misson 3** • Keep the thermometer off unless measuring the temperature of a density cube or a heat/cold pack • Do not shine the IR thermometer into people's eyes • Do not stare at the laser light from the thermometer • Session leader should ensure the IR thermometer is not handled by participants unless they are closely supervised **Mission 4** • Keep the torch off unless shining at the UV beads • Do not stare at the light from the torch • Verbal and (where appropriate) visual warnings not to look at the torch • Use a long wavelength UV torch	3 3	1 1	3 3	Yes Yes							
Choking hazard Misson 4	• Loose UV colour changing beads	Session leader(s) (e.g. teacher and support staff) Participants (e.g. school students)	• By swallowing the UV-colour changing beads	• Keep the UV-colour changing bead in a sealed petri dish	3	1	3	Yes							

Appendix 1: Protocols for each Mission in the 'Let's Move to the Moon' mission suitcase

Mission 0: Ida Noddack

1. Read the biography of Ida Noddack
2. Watch the introductory video
3. Enter the four-digit combination on the suitcase lock

Safety Info

Pinching fingers in the lock

Mission 1 – Cecilia Payne Gaposhkin

1. Place the first material on the mass balance and record its mass in grams (g).
2. Use the callipers to measure the length and diameter of the rod in millimetres (mm). For tubes, also measure the outer diameter and inner diameter in millimetres.
3. Note down any additional observations that might help decide on what to use it for. Is the material see through? How does it feel?
4. Repeat steps 1-3 for each material.
5. Calculate the density of the materials

Safety Info:

Be careful to make sure the bars of material **do not roll** off a surface and drop on your foot – it could hurt (especially the iron!) and do damage to your foot or any other body part it strikes.

Mission 2 – Stephanie Kwolek

1. Take metal ruler and bend it – what happens?
2. Take the plastic ruler and bend it – what happens?
3. Take the aluminium and polypropylene rods that were used in Mission 1 and try bending those.
4. Discuss the difference of how the different rulers bent.
5. Discuss the differences of how the plastic bar and plastic rod bent.

Safety Info

- Be careful when bending the rulers – if they snap they can result in sharp edges or splinters
- Be careful when handling the bars of materials and take care to ensure they do not roll off table tops as they could cause impact injuries.

Mission 3 – Jocelyn Bell-Burnell

1. Draw a table like the one below (or simply use the table below to input your data).
2. Activate a **cool pack** (by squeezing the little capsule inside the bag until it pops) or a heat pack and place on the desktop.
3. Place the cube onto the cool pack and record the temperature of the top face of the cube immediately (initial temperature) and set your timer.
4. After 1 minute record the temperature of the top face of the cube and calculate the temperature difference of the top face of the cube over the course of 1 minute – this will give an indication of how good a thermal conductor the material is.
5. Repeat steps 3 and 4 with the other cubes of different materials.
6. If you have time repeat steps 3-5 but use a **heat pack** instead of a **cool pack** and use the table below to record your data (or draw your own).
7. Compare the calculated temperature difference values for all of the materials and decide on which ones are best at conducting heat.

Safety Info

- Prolonged contact with activated heat / cool packs may cause discomfort and, possibly, burns (especially with the heat pack).
- If a cool / heat pack splits liquid will spill out presenting a slip hazard so best to carry out the experiment in a shallow container or on an absorbent surface (e.g. tissue paper).
- Do not shine the red laser form the .IR thermometer into eye

Mission 4 – Marie Curie

1. Draw a table to record your results.
2. Fill in the 'Materials column' with which material you will test.
3. In the second column predict how well you think the material will block out UV light using a scale of 1-10.
4. Take the Petri dish full of beads and place a sheet of material on top of the beads and shine the UV torch onto the materials for 10s.
5. Remove the materials and match the colour of the beads with the UV Sun Index chart (see below) and record the value.

Safety Info

- UV torch can cause eye damage, DO NOT look directly at the light and DO NOT shine into people's eyes
- UV colour changing bead, if spilled these can cause a slip and choking hazard so clear up and spilled beads immediately

Mission 5 - Helen Sharman

1. Place the marshmallow in the jar and screw on the lid to seal it shut
2. Connect the hand pump to the valve on the lid
3. Use our hands to pump out the air from the jar – this is harder than it looks!
4. Watch the marshmallow as we pump out the air and record any observations
5. Stop pumping and record any observations
6. Release the vacuum by opening the valve and record any observations

Safety Info

Vacuums can be very dangerous but not the ones you will be working with in this experiment. Be sure to take care not to strain yourself when operating the hand pump. Avoid putting your hands or fingers on the one-way valve when a vacuum is inside, it might suck the skin causing some discomfort and leaving a mark for some time. You might have experienced this before if you've ever sucked a water bottle around your lips! Be sure to wash all your equipment before and after use, especially if you're planning on eating your marshmallow afterwards!

Mission 6 – Zaha Hadid

1. Find a suitable launch zone. The rockets can fly high so make sure that this is either done outside or in a room with a very high ceiling with no low hanging lighting.
2. Make sure that the launch zone is clear.
3. Take a film cannister (decorate it if you want – we would love to see your pictures!) and put on safety goggles.
4. Fill the cannister to about 1/3 full of water
5. Put a effervescent vitamin C tablet in the cannister (start with ¼ of a tablet for your first launch)
6. Quickly close the lid (tightly), invert the rocket and place it lid down onto the launch pad
7. Watch to see if the rocket launches

IF the rocket doesn't launch you may need to return to it and give it a little shake or it may leak a bit.

If you return to it make sure you **do not look** directly down on the film cannister and wear goggles.

8. Try experimenting with launching the rocket again but change the tablet/water ratio or try thinking about different ways that you can set off the reaction between the effervescent tablet and water.

Safety Info

- Eye injury from flying rocket (wear eye protection). If the rocket takes a long time to launch then approach it and **do not** look directly down on it.
- If the rocket is launched inside ensure that it is launched in a room with a high ceiling (such as a sports hall) and not aimed at any light fittings or anything else which may be damaged and cause further hazards (such as cuts from broken glass).

Mission 7 – Benedetta Cappa

1. Take a big piece of paper and pens
2. Work in groups to design a moonbase and what materials you will take to the moon with you and why
3. Show your poster to our Ambassador
4. Follow the Ambassador to launch the 3D printed rocket

Rocket Launch

1. Connect foot pump to the 3D printed rocket

2. Pressurise the rocket to between 3 bar and 7 bar.

3. Release the string while holing on the wooden platform to the ground and watch the rocket take off

Risks

- Impact injuries from flying rocket
- Cuts from sharp edge of the rocket (if it breaks)

Safety precautions

- Only a Discover Materials Ambassador is allowed to operate and launch the rocket
- Ensure the participants are at least 5 m away
- The demonstration must be done outside
- Do not use the rocket is if has previously been damaged

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**
Impact on the safety of staff, students or public (physical / psychological harm)	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**
Broad descriptor	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
Time-framed descriptor	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
Probability 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.

Risk Level = Consequence / Severity x Likelihood (C x L)

	Likelihood				
Likelihood score	**1**	**2**	**3**	**4**	**5**
	Rare	**Unlikely**	**Possible**	**Likely**	**Almost certain**
5 Catastrophic	5	10	15	20	25
4 Major	4	8	12	16	20
3 Moderate	3	6	9	12	15
2 Minor	2	4	6	8	10
1 Negligible	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.