

RADIOACTIVITY STANDARDS LABORATORY LIST OF CHEMICALS

Document Change History

Revision	Summary of changes
14	Added Sr resin to section 5; added HNO ₃ and Sr resin dilutions to section 6. Added new Quicksafe A to section 7, added alcohol sanitiser to section 8.
15	Updated Regulations for Hazardous Chemical Agents (2020) in section 3; added butane gas mix & removed naphthalene mothballs from section 5; added new Ultima Gold AB, - F & - LLT to section 7; added Derma Drop sanitizer & removed BioKlenz ALCO-spray from section 8; added empty UG LLT bottle to section 9.
16	Sections 3,5, 7 & 8: Changed MSDS to SDS. Removed various chemicals disposed (in Dec. 2022) from sections 5,7 & 8. Added Doom & yellow paint to section 5; added CdCl ₂ dilution to section 6; added new Ultima Gold (Lot 77-22301) to section 7. Added 3x chemicals to be disposed to section 9.
17	Section 7: added acceptability checks done on cocktails; removed disposed Quicksafe A & Ultima Gold F bottles & added bottle of Ultima Gold LLT (97-23231) in table. Section 8: corrected info on hand sanitizer & Extran bottles. Section 9: Removed chemicals disposed in March 2023 (chloroform, cadmium sulphate & mercuric chloride). Added empty- & waste bottles of UG LLT & Derma Drop sanitizer.
18	Section 5: added Adhesives, AG Cation Resin & Sr Resin SR-B2000-A; updated Tritium columns. Section 6: updated- & added dilutions of HCl, HNO ₃ and Sr(NO ₃) ₂ Carrier. Section 7: removed Ultima Gold Lot no. 97-23231 & added Lot no. 97-24285. Section 8: updated Extran MA01 CAS no. and added 10 % dilution bottles. Section 9: updated list of chemicals for disposal.

1. PURPOSE

This document summarises the chemicals available- & used inside the Radioactivity Standards Laboratory (RSL) and NMISA Rosebank offices.

2. APPLICABILITY

This procedure applies to NMISA staff involved in operating the NMISA Radioactivity Standards Laboratory in Rosebank, Cape Town.

3. REFERENCES

Occupational Health and Safety Act, 85 of 1993 - Regulations for Hazardous Chemical Agents, 2020

Safety Data Sheets (SDS) websites, e.g. <http://www.ilpi.com/msds/>,
<http://www.ehso.com/msds.php>

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Effective date: 20 March 2025	Page 1 of 8	Document number: RS-CHM-0001-18

**NATIONAL METROLOGY INSTITUTE OF SOUTH AFRICA
TOTAL QUALITY MANAGEMENT SYSTEM**

4. SUMMARY OF LOCATIONS

Location	Description
Chemistry lab	Room 25
Sample Preparation lab	Part of Room 25
Counting lab	Room 26
Lower Level lab	Extension to Room 26
Cupboard - Counting lab	Wall Cupboard in the Counting lab, next to the Weighing room
Cupboard - Chemistry lab	Storage cupboard next to the Strong Room
Cupboard - Lower-Level lab	Wall Cupboard in Lower Level lab, above NMISA HPGe detector set-up
Weighing room	Weighing room in Counting lab (Part of Room 26)
Chemical cabinet	Cabinet in Chemistry lab for storage of harmful, flammable and corrosive chemicals
Desiccator cabinet	Cabinet kept in Sample Preparation lab for storage of dry chemicals/ salts

5. LIST OF GENERAL LABORATORY CHEMICALS & PAINTS

Compound	Chemical formula	CAS no.	Supplier, Amount & Container	SDS Filed	Location
Acetone	CH ₃ COCH ₃	67-64-1	Merck 2 L & 2.5 L brown glass bottles	Yes	Chemical cabinet
Adhesives	Unknown	Unknown	Genkem Clear 50 ml tube & Contact 100 ml tube. Pattex No More Nails 50 g tube	No	Cupboard Chemistry lab
AG Cation Exchange Resin - Hydrogen form, C4-B500-M-H	Unknown	Mixture: 69011-20-7 007732-18-5	Eichrom Technologies 500 g brown plastic bottle	Yes	Cupboard Chemistry lab
Aliquat 336	CH ₃ N[(CH ₂) ₇ CH ₃] ₃ Cl	63393-96-4	Sigma-Aldrich 250 ml brown glass bottle	Yes	Chemical cabinet
Aluminium nitrate nonahydrate	Al(NO ₃) ₃ · 9H ₂ O	7784-27-2	Merck 500 g plastic bottle	Yes	Desiccator cabinet
Ammonia	NH ₄ OH	1336-21-6	10 ml in glass vial	Yes	Chemical cabinet
Ammonium hydroxide	NH ₄ OH	1336-21-6	Sigma-Aldrich 1 L brown glass bottle	Yes	Chemical cabinet
Ammonium dihydrogen phosphate	(NH ₄)H ₂ PO ₄	7722-76-1	Merck 500 g plastic bottle	Yes	Desiccator cabinet
Armour Etch cream	For etching of glass vials	7664-93-9 & 7727-43-7	Armour Products 1.5 oz plastic bottle	Yes	Desiccator cabinet
(ASAP) Sodium polyacrylate	C ₃ H ₃ O ₂ Na	N/A	Chemdall Ltd. 500 g plastic bottle	Yes	Desiccator cabinet
Bis (2-ethylhexyl) phosphoric acid (HDEHP)	C ₁₆ H ₃₅ O ₄ P	298-07-7	Merck 250 ml brown glass bottle	Yes	Chemicals cabinet

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Compound	Chemical formula	CAS no.	Supplier, Amount & Container	SDS Filed	Location
Bis-MSB or 1,4 bis (2-methylstyryl) benzene	C ₂₄ H ₂₂	13280-61-0	Fluka 25 g brown glass bottle	Yes	Desiccator cabinet
Butane, isobutane & propane gas	Mixture	106-97-8 75-28-5 74-98-6	RS Pro 200 ml can	Yes	Cupboard Chemistry lab
Cadmium chloride	CdCl ₂	10108-64-2	Fischer 100 g brown glass bottle	Yes	Desiccator cabinet
Caesium chloride	CsCl	7647-17-8	Hopkin & Williams 5 g brown glass bottle; BDH 5 g brown glass bottle	Yes	Desiccator cabinet Desiccator cabinet
Caesium sulphate	Cs ₂ SO ₄	10294-54-9	Merck 5 g brown glass bottle	Yes	Desiccator cabinet
Calcium nitrate tetrahydrate	Ca(NO ₃) ₂ ·4H ₂ O	13477-34-4	Merck 500 g plastic bottle	Yes	Cupboard Chemistry lab
CATANAC	C ₂₅ H ₅₃ N ₂ O ₂ ·5H ₂ O ₄ P	3758-54-1	25 ml volumetric flask	Yes	Chemical cabinet (with dilutions)
Cobalt (II) chloride	CoCl ₂ ·6H ₂ O	7791-13-1	Merck 100 g brown glass bottle	Yes	Desiccator cabinet
Cobalt sulphate	CoSO ₄ ·7H ₂ O	10026-24-1	3 g in glass vial	Yes	Desiccator cabinet
Doom	D-Phenothrin (Pyrethroid) 0,92 g/kg, Prallethrin (ETOC) (Pyrethroid) 0,4 g/kg, Imiprothrin (Pyrethroid) 0,25 g/kg	53-2004723	300 ml can	Yes	Office 3; Metal cabinet
Ethanol, 99.8% (Abs)	CH ₃ CH ₂ OH	64-17-5	Merck 2.5 L plastic bottle	Yes	Chemical cabinet
Europium (III) nitrate	Eu(NO ₃) ₃ ·5H ₂ O	10031-53-5	Merck 1g brown glass bottle	Yes	Desiccator cabinet
Gallium	Ga (metal)	7440-55-3	Glass vial	Yes	Desiccator cabinet
Glass wool		65997-17-3	Sigma Aldrich 250 g cannister (x2)	Yes	Sample Prep lab
Hairspray	Unknown	Unknown	145 ml spray-can	No	Cupboard Chemistry lab
Hexane Emplura	C ₆ H ₁₄	110-54-3	Merck 2.5 L brown glass bottle	Yes	Chemical cabinet
Hydrochloric acid, 37%	HCl	7647-01-0	Sigma-Aldrich 2.5 L brown glass bottle	Yes	Chemical cabinet

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Compound	Chemical formula	CAS no.	Supplier, Amount & Container	SDS Filed	Location
HySorb M7150 Sodium polyacrylate	C ₃ H ₃ O ₂ Na	N/A	BASF 500 g plastic bottle	Yes (similar)	Desiccator cabinet
Lutetium (III) chloride	LuCl ₃ . 6H ₂ O	15230-79-2	Sigma-Aldrich 1 g brown glass bottle	Yes	Desiccator cabinet
Nitric acid, 65%	HNO ₃	7697-37-2	Merck 2.5 L brown glass bottle	Yes	Chemical cabinet
Nitromethane	CH ₃ NO ₂	75-52-5	Fluka 100 ml brown glass bottle	Yes	Chemical cabinet
Oxalic acid dihydrate	(COOH) ₂ .2H ₂ O	6153-56-6	Merck 500 g plastic bottle	Yes	Cupboard Chemistry lab
2-Phenoxy ethanol	C ₈ H ₁₀ O ₂	122-99-6	Fluka 2.5 L brown glass bottle	Yes	Chemical cabinet
Phenolphthaleine indicator	C ₂₀ H ₁₄ O ₄	77-09-8	Merck, 100 g brown glass bottle	Yes	Desiccator cabinet
Phosphorous	P (spheres, 0.5 mm diameter)	Unknown	Nuclear Enterprises, brown glass bottle	No	Desiccator cabinet
Polyethylene glycol 200		25322-68-3	Fluka 250 ml plastic bottle	Yes	Cupboard Chemistry lab
POPOP	1,4-bis (5-phenyl-2-oxazolyl) benzene	1806-34-4	Nuclear Enterprises 25 g brown glass bottle	Yes	Desiccator cabinet
Potassium chloride	KCl	7447-40-7	Sigma-Aldrich 100 g plastic bottle	Yes	Desiccator cabinet
Propan-2-ol	CH ₃ CHOHCH ₃	67-63-0	Merck, 2.5 L plastic bottle	Yes	Chemical cabinet
Propyl 4-hydroxybenzoate	C ₁₀ H ₁₂ O ₃	94-13-3	Aldrich 5 g white plastic bottle	Yes	Desiccator cabinet
Rapid Epoxy Adhesive (Resin & Hardener)		25068-38-6	Alcolin 12 ml plastic tubes x2	Yes	Cupboard Chemistry lab
Rubidium chloride	RbCl	7791-11-9	Merck 5 g brown glass bottle	Yes	Desiccator cabinet
Silica Gel Blue & Orange		112926-00-8 Mixture	Labotec, 1 kg Blue pearls Sigma-Aldrich, 2 kg Orange pearls	Yes	Desiccator & in tray of Desiccator cabinet
Spray-paints	Black Yellow	Unknown	250 ml spray-can 250 ml spray-can	No	Cupboard Chemistry lab
Sodium acetate	CH ₃ COONa	127-9-3	BDH 250 g brown glass bottle	Yes	Desiccator cabinet
Sodium benzoate	C ₆ H ₅ COONa	532-32-1	Saarchem/ Merck 500 g plastic bottle	Yes	Cupboard Chemistry lab
Sodium citrate	Na ₃ C ₆ H ₅ O ₇ .2H ₂ O	6132-04-3	Merck 500 g brown glass bottle	Yes	Desiccator cabinet

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Compound	Chemical formula	CAS no.	Supplier, Amount & Container	SDS Filed	Location
Sodium hydroxide pellets	NaOH	1310-73-2	Merck, 500 g plastic bottle	Yes	Cupboard Chemistry lab
Strontium chloride	SrCl ₂ .6H ₂ O	10025-70-4	Hopkin & Williams 100 g brown glass bottle	Yes	Desiccator cabinet
Strontium nitrate	Sr(NO ₃) ₂	10042-76-9	Merck, 250 g plastic bottle & 50 ml plastic bottle	Yes	Cupboard Chemistry lab
Strontium Resin, SR-B100-A		Mixture	Eichrom Technologies, 100 ml plastic bottle	Yes	Cupboard Chemistry lab
Strontium Resin, SR-B200-A		Mixture	Eichrom Technologies, 200 g brown plastic bottle	Yes	Cupboard Chemistry lab
Tensol no. 12 glue (for Perspex)		Mixture	Maizey 100 ml plastic bottle	Yes	Cupboard Chemistry lab
Thallium carbonate	Tl ₂ CO ₃	6533-73-9	BDH 25 g brown glass bottle	Yes	Desiccator cabinet
Tritium columns, H3-C50-A (2 ml)		Mixture: 67-56-1	Eichrom/ Triskem box of maximum 50x columns	Yes	Cupboard Chemistry lab
Universal indicator strips	pH 0-14	N/A	Filter Lab, plastic box	N/A	Cupboard Chemistry lab
Vermiculite		1318-00-9	Large bags and 2x plastic buckets (approx. 10 kg)	Yes	Various locations in labs
Vyns	For proportional counting	N/A	Union Carbide, Brown cardboard cylinder	No	Cupboard Chemistry lab
Water (Deionised)	H ₂ O	N/A	Plastic spray bottles & water purification system	No	Chemistry- & Sample Prep labs
p-Xylene	C ₈ H ₁₀	106-42-3	Merck 2.5 L brown glass bottle	Yes	Chemical cabinet
Yellow paint		Unknown	Dulux 5 L plastic can	No	Cupboard Chemistry lab
Yttrium chloride	YCl ₃ .6H ₂ O	10025-94-2	Merck 5 g glass vial	Yes	Desiccator cabinet

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6. LIST OF CHEMICAL DILUTIONS

Chemical	Concentration	Carrier solution	Container	Location
AgNO ₃	100 mg/l	H ₂ O	100 ml volumetric flask	Chemical cabinet
BaCl ₂	1.2 g	3 M HCl	50 ml volumetric flask	Chemical cabinet
BaCl ₂	2.3 g/l (2.3 mg/ml)	0.1 M HCl	50 ml volumetric flask	Chemical cabinet
BaCl ₂	~ 8.7 g/100 ml	H ₂ O	100 ml volumetric flask	Chemical cabinet
BaCl ₂ ·2H ₂ O	9.8 g/l	H ₂ O	50 ml volumetric flask	Chemical cabinet
CdCl ₂	~ 18 µg/g	0.1 M HCl	10 ml volumetric flask	Chemical cabinet
CdCl ₂	500 mg/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
Ce	1 µg/l	1 M HNO ₃	100 ml plastic bottle	Chemical cabinet
CeCl ₃	1.08 g/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
CH ₃ COONa	1%	0.003 M HCl	100 ml volumetric flask	Chemical cabinet
Cobalt	100 µg/ml	0.1 M HCl	50 ml volumetric flask	Chemical cabinet
CoCl ₂	0.45 g/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
CsCl	570 mg/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
EuNO ₃	0.1 g/ 100 ml	1 M HCl	100 ml volumetric flask	Chemical cabinet
FeCl ₂	780 mg/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
FeCl ₃	15 g/l	5 M HCl	100 ml volumetric flask	Chemical cabinet
Ga	2.6 g/l	1 M HCl	50 ml volumetric flask	Chemical cabinet
HCl	0.1 M		100 ml & 1 L volumetric flasks	Chemical cabinet
HCl	0.5 M		50 ml volumetric flask	Chemical cabinet
HCl	1 M		2x 50 ml volumetric flasks 1x 100 ml volumetric flask	Chemical cabinet
HCl	3 M		2x 100 ml volumetric flasks	Chemical cabinet
HI	1 M		100 ml volumetric flask	Chemical cabinet
HNO ₃	0.05 M		200 ml volumetric flask, 1 L plastic bottle, 750 ml plastic wash bottle	Chemical cabinet
HNO ₃	0.1 M		1 L plastic bottle, 750 ml plastic wash bottle	Chemical cabinet
HNO ₃	2 M		10 ml volumetric flask	Chemical cabinet
HNO ₃	3 M		10 ml volumetric flask	Chemical cabinet
HNO ₃	8 M		200 ml volumetric flask, 1 L plastic bottle, 750 ml plastic wash bottle	Chemical cabinet
LuCl ₃	5 µg/g	1 M HCl	50 ml volumetric flask	Chemical cabinet
LuCl ₃	50 µg/g	1 M HCl	100 ml volumetric flask	Chemical cabinet
MnCl ₂	500 mg/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
NH ₄ OH	0.1 M		25 ml volumetric flask; 10 ml vial	Chemical cabinet
Na ₂ CO ₃	485 mg/l	H ₂ O	10 ml volumetric flask	Chemical cabinet
Na ₂ S ₂ O ₃	174 mg/l		100 ml volumetric flask	Chemical cabinet
Na ₂ SeO ₄	1 g/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
NaCl	500 mg/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
NaH ₂ PO ₄	80 mg/l	1.2 g/l HCHO	10 ml volumetric flask	Chemical cabinet
NaH ₂ PO ₄	4.5 g / 100 ml	H ₂ O	100 ml volumetric flask	Chemical cabinet
NaI	108 mg/l		100 ml volumetric flask	Chemical cabinet
NaOH	0.1 M		100 ml volumetric flask	Chemical cabinet
Carrier for Iodine	59 mg/l NaI 40 mg/l NaOH 78 mg/l Na ₂ S ₂ O ₃	H ₂ O	100 ml volumetric flask	Chemical cabinet

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Chemical	Concentration	Carrier solution	Container	Location
NiCl ₂	500 mg/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
NiCl ₂	510 mg/l	H ₂ O	10 ml volumetric flask	Chemical cabinet
SrCl ₂			25 ml volumetric flask	Chemical cabinet
SrCl ₂ / YCl ₃	150 mg/l Sr 150 mg/l Y	0.15 M HCl	100 ml volumetric flask	Chemical cabinet
Sr(NO ₃) ₂	24.4 g/l	H ₂ O	1 L plastic bottle, (Sr Carrier 1)	Chemical cabinet
Sr Resin + HNO ₃ (diluted)			100 ml PP bottle	Chemical cabinet
TiNO ₃	0.5 g/l	1 M HCl	100 ml volumetric flask	Chemical cabinet
TiNO ₃			100 ml volumetric flask	Chemical cabinet
TiNO ₃	Saturated soln		2 x 100 ml volumetric flasks	Chemical cabinet
TiNO ₃	0.5 mg/ ml	0.1 M HNO ₃	100 ml volumetric flask	Chemical cabinet
YCl ₃	51 µg/g	1 M HCl	100 ml volumetric flask	Chemical cabinet
YCl ₃	57 µg/g	1 M HCl	100 ml volumetric flask	Chemical cabinet
YCl ₃	0.1g/ 100 ml	1 M HCl	2 x 100 ml volumetric flasks	Chemical cabinet

7. LIST OF LIQUID SCINTILLATORS AND RELATED FLUIDS

A record sheet for liquid scintillation cocktails (Form RS-TEC-2005) is available on the inside of the Chemical cabinet, to keep track of the cocktails available. The record sheet notes the date received, date bottles were opened, the expiry date, acceptability checks done on the cocktails and any observed deterioration of the cocktails.

Compound (Lot no.)	CAS no.	Supplier, Amount & Container	SDS Filed	Location
Immersion oil 518C	Mixture, 85535-84-5	Zeiss 500 ml brown glass bottle; 2x small dispensing bottles	Yes	Cupboard – Counting lab
Immersion oil for microscopy	Mixture 120-51-4	Merck 500 ml brown glass bottle	Yes	Cupboard – Counting lab
Ultima Gold (77-22301)	Mixture	PerkinElmer 1 L brown glass bottle	Yes	Chemical cabinet
Ultima Gold AB (91-21331)	Mixture	PerkinElmer 1 L brown glass bottle	Yes	Chemical cabinet
Ultima Gold LLT (97-21481)	Mixture	PerkinElmer 1 L brown glass bottle	Yes	Chemical cabinet
Ultima Gold LLT (97-24285)	Mixture	Revvity 1 L brown glass bottle (x2)	Yes	Chemical cabinet

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8. LIST OF CLEANING AGENTS & LUBRICANTS

Compound	CAS no.	Supplier, Amount & Container	SDS Filed	Location
Derma Drop Waterless hand sanitizer	Mixture: Mainly 64-17-5	Midway Cash & Carry 25 L carboy; 5 L plastic bottle, 500 ml plastic pump bottles & 250 ml plastic spray bottles.	Yes	Under sink in Chemistry lab; Lab- & office spray bottles, pump bottles & Foot pedal dispensers
Extran MA 01	Mixture: 9002-92-0 1310-73-2	Merck 1 L plastic bottle, 10% dilutions in 1 L plastic bottle & 750 ml wash bottle.	Yes	Chemical cabinet
Brasso metal polish	Mixture	500 ml metal can	Yes	Cupboard - Chemistry lab
Q in-one multi-purpose oil	Mixture	100ml plastic bottle	Yes	Cupboard - Chemistry lab
WD-40 lubricant & rust remover	Mixture	WD-40 200 ml spray-can	Yes	Cupboard - Chemistry lab
Dow Corning high vacuum grease	N/A	Sigma Aldrich 150 g tube		Cupboard – Counting lab
Dow Corning® high vacuum grease	N/A	Dow Corning 20 g in plastic tub	Yes	Cupboard - Lower Level lab
Xiameter® PMX-200 Silicone Fluid 50 CS	N/A	Dow Corning 100 ml plastic spray-bottle	Yes	Cupboard - Lower Level lab
Cavi-clean liquid detergent	Mixture	Mettler Electronics 100 ml plastic bottle	Yes	Chemistry lab, under sink
Handy Andy	Unknown	400 ml in plastic bottle	No	Chemistry lab, under sink
Sunlight Liquid	Unknown	400 ml in plastic bottle	No	Chemistry lab, under sink
Office Equipment & White board cleaner	Mixture: mainly 67-63-0	Parrot Products 250 ml plastic bottle (x2)	Yes	Office 3; Metal cabinet
Marine silicone sealant		Bostik tubes 90 ml (x2)	No	Cupboard - Chemistry lab
Pratley putty		Pratley	No	Cupboard - Chemistry lab

9. CHEMICALS TO BE DISPOSED

Compound	CAS no.	Amount & Container	Location
Mixed Hexane & ethanol waste	Mixture	2.5 L brown glass bottle	Chemical cabinet
Mixed Hexane & LSC (Quicksafe A) waste	Mixture	2.5 L brown glass bottle	Chemical cabinet
Mixed Inorganic waste (HCl; HCl + HDEHP)	Mixture	2.5 L brown glass bottle	Chemical cabinet
Nitric acid (HNO ₃) waste, non-halogenated, + HDEHP	Mixture	500 ml waste in 2.5 L brown glass bottle	Chemical cabinet
Empty Ultima Gold bottle	Mixture	Residue in 1 L brown glass bottle	Chemical cabinet
Ultima Gold waste bottle	Mixture	250 ml plastic bottle	Chemicals cabinet
Ultima Gold LLT waste bottles	Mixture	250 ml plastic bottles (2x)	Chemical cabinet