Rowett Institute of Nutrition and Health (RINH)

Ionising Radiation Regulations 1999

LOCAL RULES

These rules apply to the following areas:-
4.029 (counting room), 4.030 (radiation lab), 4.034 (hybridisation lab).

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Review date May 2018

Note If you are readings this document after the review date please check with your RPS that you have the latest version

Overview

- Only registered and suitably trained workers are permitted to work with isotopes in the university of Aberdeen.

- Registration is initiated using the Iso Inventory software (http://isoinventory.abdn.ac.uk/).

- Completion of the online radiation user training course (accessed via https://www.abdn.ac.uk/safety/resources/radiation/ionising/) is mandatory before users can be registered. It is also mandatory for new users even if they have completed a similar course elsewhere.

- Supervisors and/or line-managers are responsible for ensuring that all technical or research staff and post-graduate students in their groups are registered to use isotopes *before* any such work commences.

- Registration MUST be completed before any request is made for access to rooms 4.030 and 4.034

- Supervisors and/or line-managers are responsible for ensuring that all workers are fully familiar with the IsoInventory software system that is used for isotope registration and the keeping of records of their usage and disposal.

- Completion of a refresher

Isotope users who do not comply with these rules may be subject to disciplinary action including being barred from working with isotopes.

1. Radiation protection supervisor:

Dana Wilson Lab 4.035 (ext 8753) Write up 4.037 (ext 8752) dana.wilson@abdn.ac.uk
Lynn Thomson Lab 4.035 (ext 8753) Write up 4.037 (ext 8752) l.thomson@abdn.ac.uk

2. Designated areas

Controlled radiation areas	Supervised radiation areas
4.030	4.029, 4.034

3. Unsealed Radionuclides used

Radionuclide	Half Life	Emissions	Contamination monitor
35S	87 days	Beta	GM detector e.g. EP15
3H	12.3 years	Beta	Wipe tests, liquid scintillation counting
14C	5730 years	Beta	GM detector e.g. EP15
125I	60 days	Gamma	44A scintillation detector

4. Holding and Disposal Limits for RINH per month (MBq)

Radionuclide	Holding	Drain Disposal
35S	80	30
3H	300	300
14C	100	100
125I	90	125

5. Radiation Equipment used in the area

Packard Tri-Carb 2900TR Liquid scintillation Analyser
Perkin Elmer Wizard 1470 Automatic Gamma Counter

6. General Lab arrangements

These rules must be posted in each laboratory radioactive materials are handled. A prior risk assessment must be carried out before commencing new work activities and recorded using form on the iso-inventory system.

Access to the lab

- Access to radiation areas should be restricted to those who have been trained and are directly involved in the experiment unless authorised unless they are under the close supervision of the RPS. Only trained, registered workers may handle

General

- Work with radioactive materials should only be carried out in designated areas identified in section 2. If you wish to carry out work in an area not identified in section 2 then contact your RPS for advice.

- Experiments should be carefully planned and should only take place if no other equivalent experiment which does not involve radioactive substances exists. We are obliged by legislation to ensure that any experiments that require the use of an isotope utilizes the minimum quantity of radioactivity that will ensure a viable result.

- Consideration should be always be given to using the least hazardous radionuclide for example P-33 should be used in preference to P-32.

- Experiments involving radioactive materials should only be carried out by suitably trained staff/students. Any new member of staff or student wishing to undertake work with unsealed radioactive substances **must** first have completed the basic radiation safety course, available online at https://www.abdn.ac.uk/safety/resources/radiation/ionising/. Previous experience/training elsewhere is **not** sufficient. Additionally the principal investigator/RPS should ensure that all staff or students working on the experiment are proficient in basic laboratory techniques and in the protocols required for the experiments with isotopes, before they start manipulation of radioactive substances unsupervised. It is important that all staff involved in this work are suitably trained in carrying out contamination monitoring. A refresher course should be completed every 3 years.

lab procedures

- Observe all the basic laboratory safety procedures:
    - There must be NO eating, drinking or applying cosmetics in the laboratory
    - Never use your mouth to pipette
    - If you see a colleague doing something dangerous, point it out to him/ her immediately and if necessary report it to the RPS
    - Work must not be carried out by a person with an undressed cut or abrasion below the wrist

- Lab coats or other suitable protective clothing should be worn at all times when entering a supervised area. Disposable gloves and protective eyeglasses should be worn whenever unsealed sources are being handled or manipulated.

- Work should be carried out over trays wherever possible.

- Contamination monitoring should take place **before** starting work and **after** the work is completed. Procedures for carrying out and recording contamination monitoring are explained in section 11.

- If using isotopes other than Tritium always check your gloves, hands and laboratory coat for radioactive contamination before leaving the laboratory.

- Wash your hands using the hand wash sink before leaving the laboratory.

- All apparatus being used with radioactive materials must be labelled using “radioactive” warning tape. The tape must be removed when the apparatus has been washed and found to be clear of contamination.

- Radioactive substances must only be removed from controlled or supervised areas in closed uncontaminated containers.

- Radionuclides emitting penetrating radiations must be adequately shielded. Lead shielding must be used for gamma emitters and perspex shielding for beta emitters.

- Containers for radioactive materials other than Carbon - 14 and tritium should not be directly held in the unprotected hand. (Note: the outside of containers of Carbon-14 and H-3 can become contaminated so it is good practice to wear gloves when handling them). Tweezers should be used for handling sealed radioactive sources.

- Contamination must be contained without delay and you must be familiar with the contingency procedures given in section 15

- Keep time manipulating radioactive substances to a minimum.

- Place any waste items in the appropriate bin as described in section 14

- Keep all radioactive materials in labelled containers and stored in designated fridge or freezer. In general, fridges that are used to store radioactive materials should not be used to store non active items. If it is necessary to use a fridge or freezer for active and non-active items there should be clear demarcation and additional containment for the active items.

- In case of emergency remain calm and follow the contingency procedures section 15.

7. Local arrangements and procedures

All radioactive sources should be stored in 4.030

8. Pregnant and breast feeding

Any worker who becomes pregnant should inform the Radiation Protection Supervisor as soon as possible and discuss the situation. It is also the University's policy that anyone who works with any form of ionising radiation and becomes pregnant should be given the option of alternative work. This recommendation would also apply to breast feeding mothers. However if the pregnant or breast feeding female continues working a risk assessment should be carried out to assess the hazard and additional protection measures that may be required. The RPA can advise.

9. Personal Monitoring

If you are issued with a personal dose monitor you must wear it and it is your responsibility to look after it. These badges should be worn at hip or waist level. For work with certain isotopes, additional dosimeters may have to be worn on the fingers or at neck level. If you lose your dosimeter or it is damaged (or goes through a washing machine) tell your RPS without delay and arrangements will be made to issue a replacement. You should stop working with radioactive materials until a replacement monitor has arrived.

Personal dosimeters if required will be issued and collected by the RPS.

10. Dose investigation levels

The following dose investigation levels apply.

	Effective whole body dose (mSv)	Equivalent dose to the skin (averaged over <100cm^2) (mSv)	Equivalent dose to lens of the eye. (mSv)	Equivalent dose Hands, forearms, feet and ankles (mSv)
Investigation level (over the wear period of the dosimeter[1])	0.3	7.5	2	7.5

[1]wear period will be either 1 or 2 months as directed by RPA

If one of these levels is exceeded an immediate investigation should take place to establish why the level has been exceeded and any preventative actions that are required.

11. Contamination monitoring

Contamination monitoring must be carried out **before** commencing any work with unsealed radioisotopes and **after** completion of the work. Routine monitoring of the area should also take place every 2 weeks unless the area is not being used for radioisotope work for a period of time. Users should also monitor themselves when work is completed or during work if contamination is suspected.

See **Appendix 1** for a detailed description of contamination monitoring procedures.

12. Ordering radioactive materials

Sealed sources must not be ordered

Ordering: The amount of any isotope that can be stored at RINH is strictly controlled (section 4). **All unsealed radioisotopes will be ordered by one the RPSs** (Dana Wilson, Lynn Thomson). If you require unsealed radioisotopes to be ordered please get in touch with one of the RPSs and they will place the order for you, after ensuring you are authorised to work with the required unsealed radioisotope and the appropriate assessment(s) have been completed (Note that assessments must include a description of procedures for measuring or estimating the activity of each waste item – see section 14 and must be completed and approved by the Radiation Protection Advisor prior to placing any order for that specific type of source). Orders for radioisotopes raised by anyone other than a RPS will not be approved by the School Finance Person(s).

Vial arrival: When the package arrives it must be signed for by one of the stores staff, stores will then deliver the package to the RPS that raised the order. If that RPS is unavailable they will contact another RPS or a named person that is nominated by the RPSs. The RPS will then write the ISO number on the container, store it in the fridges or freezers in lab 4.030 and log its receipt on the Iso-inventory and inform the user of its arrival.

Damaged packages: In the event of a package being delivered in a damaged state stores will immediately contact one of the RPSs who will deal with it appropriately and inform the intended recipient.

13. Storing radioactive materials

All isotopes must be stored in fridge or freezer in lab 4.030.

Entry to 4.030 is made using your ID card and is restricted to registered isotope users only. **Do not lend your card to others – you will be held responsible for any mistakes or infringements made by them.** All users of this room whether dispensing isotope or performing experiments with

isotopes must perform pre-and post- contamination checks and complete the results of these and the other required details on the forms provided.

Room 4.030 is a multi-user facility and should therefore be kept in a clean, tidy and contamination-free state.

14. Disposing of radioactive waste

Each laboratory must have in place procedures for measuring or estimating the activity of each waste item. For instance an experiment may produce both liquid waste and solid waste, the majority of waste activity will be disposed of as aqueous liquid but typically there will a residue deposited in vials on other experimental disposables, there must be a documented method for estimating or measuring the activity of the residuals.

Such documented methods must be entered into the Assessment required to be completed within the Isoinventory system for the use of each radioisotope by each group, under the 'Description of Work' section within the assessment. Assessments will NOT be approved if they do not.

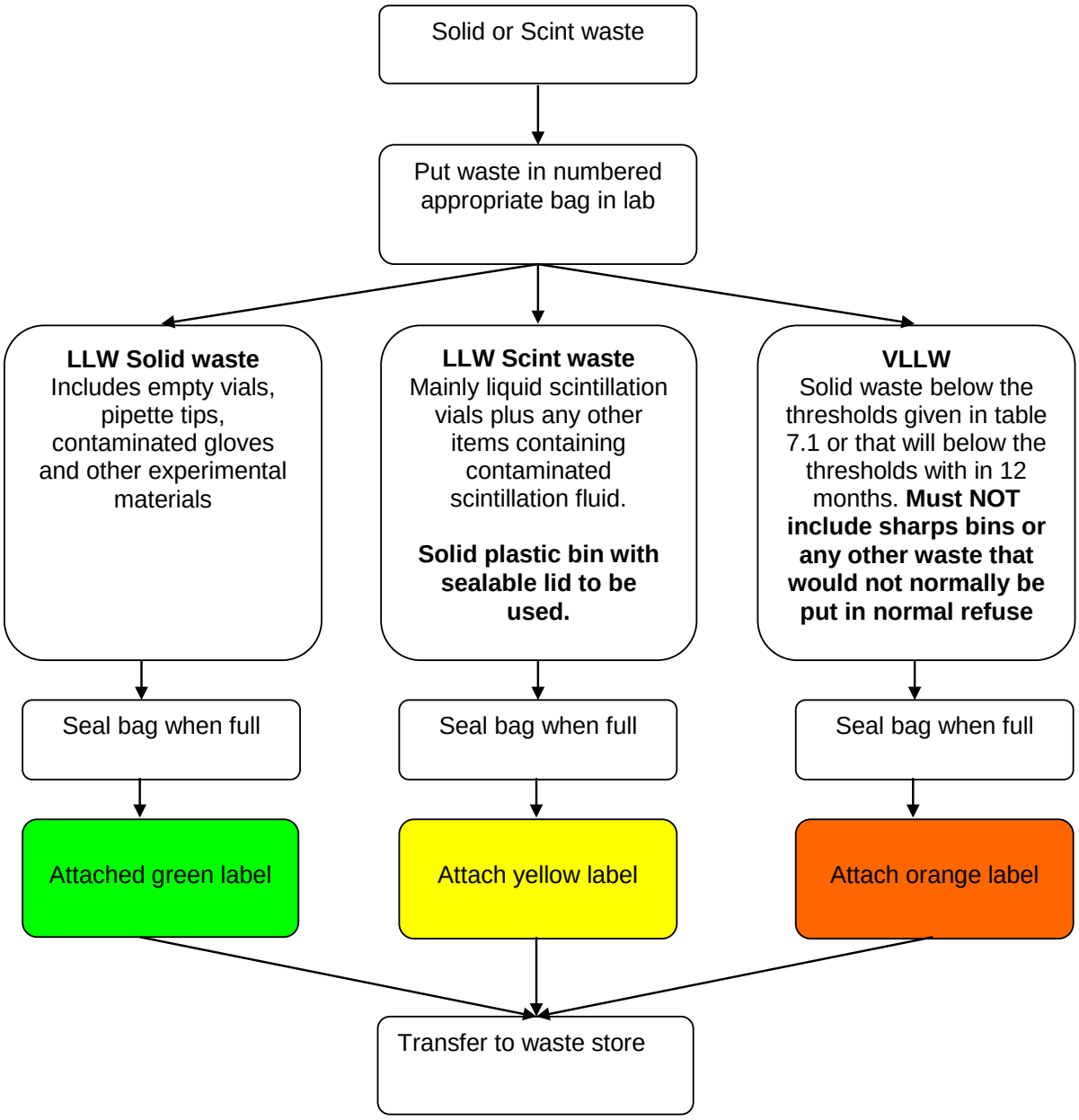
Aqueous Liquid Waste

This may be disposed of only via the approved sinks in the radioactive laboratories and with the following precautions:

- The radioactive waste should be poured carefully and directly into the waste outlet.
- The total activity of waste discharged per month must not exceed the maximum permitted under the terms of the Authorisation Certificate for the school given in section 4. Liquid waste disposals should be logged onto the iso-inventory system before disposal is made to ensure limits are not breached.

Solid waste

Solid waste should be disposed of according to the following diagram.



Add in any information about which bins should be used for each category of waste and location of spare bags, who can seal bags etc.

Scintillation waste and vials must be disposed of using a solid plastic bin/tube with a sealable lid to prevent leakage in the waste store.

Never dispose of non-radioactive waste with radioactive waste. If you are unsure check the waste with a suitable contamination monitor. Cans and packaging in which radioactive material has been supplied are not normally contaminated. These should be checked with a suitable monitor and, if no contamination is detected, treated as non-radioactive waste. Be sure to remove references to radioactivity; for example, the outer labels of cans should be removed or obliterated or otherwise defaced.

15. Contingency arrangements

RADIATION SPILLAGE

1. Immediately alert personnel working near the area of the radiation spill and if possible alert RPS. If in doubt contact radiation protection service for help and advice. Any personnel not required to deal with the spillage should remove themselves from the area after checking themselves for contamination.

2. Put on apron, over shoes and gloves

3. Do not allow anyone to walk through the spillage and spread the contamination. If possible isolate and cordon off the area.

4. Use a contamination monitor to locate areas of contamination on the work bench, floor and workers.

5. **If a worker has become contaminated deal with them first** (although it would be prudent to cover the spillage with absorbent material such as paper towels to prevent it from spreading.)

   - If a member of worker believes they are contaminated they should always attempt to locate the contaminated area and decontaminate just that area. Only if large areas of the body are contaminated should staff resort to a full body shower.

   - ***Contamination of the skin, hands, arms.*** If significant contamination is found on the hands staff should remove and discard gloves and re-monitor their bare hands. If still contaminated then the hands should be washed using a suitable detergent and then re-monitored and if necessary a soft brush should be used. Care should be taken not to break the skin. Other areas of exposed skin should be washed in a similar manner and re-monitored. The RPS should make a suitable report of any incident, including an estimation of dose, and submit to the RPA.

   - ***Contamination in the eyes.*** If a member of staff suspects that radioactivity has splashed into their eyes, they should use an eye bath. Another member of staff should then take a reading using the contamination monitor. If contamination persists then contact the RPA. The RPS should make an appropriate report of any incident, including an estimation of the dose, and submit it to the RPA.

   - ***Contamination on clothing.*** If contamination is found on a lab coat or other clothing it should be removed, bagged and either disposed of or be allowed to decay.

6. Cover the spillage with absorbent material such as paper towels to prevent it from spreading.

7. Remove as much contamination as possible by absorbing the spill on paper towels. Contaminated towels should be disposed of as radioactive waste.

8. Ensure that any glass that has broken is placed in a sharps bin and label as radioactive.

9. Any residual contamination should be cleaned using a detergent, when mopping up always work from the outside in.

10. Monitor the area to ensure that all the activity has been removed.

11. If the area has been cleared of radioactivity, remove the tapes and signs.

12. Remove apron, shoes, gloves and place in the plastic bag monitor and dispose as radioactive waste if necessary

13. Monitor hands, clothes and feet to ensure that they are not active.

14. If clothes or shoes become contaminated, remove them and bag them. If mildly contaminated they should be washed as normal before they are worn again.

Appendix 1

Contamination Monitoring Procedures

A1.0 Introduction

Contamination monitoring should be carried out **before** commencing any work with unsealed radioactive material and after completion of the work (see A1.1). In labs where half lives greater than 24 hours are used, a check of the area should be made every 2 weeks (see A1.2). Users should also monitor themselves when work is completed or during work if contamination is suspected. If a significant spill occurs then follow the lab contingency plans given in the local rules.

Contamination monitoring must be recorded in each lab or work area on the *contamination monitoring record* provided at the end of this appendix. In labs where more than one radionuclide is regularly used a separate sheet is used for each isotope. Both daily before and after work checks and area checks should be recorded on this sheet. Each column should be dated and records for that day entered in that column. If multiple experiments take place or if contamination is found then more than one column can be used for each day.

For before and after work monitoring rooms 4.030 and 4.034 have been demarcated into areas with each allocated a letter, monitoring should be carried out in the areas used and any equipment used should be checked. Maps of each room are attached to the clipboards in each lab for reference and the areas on the benches are marked.

A1.1 Contamination Monitoring Before and After Work with Radionuclides

A1.1.1 Instructions for monitoring all radionuclides except tritium (H-3)

1. Select an appropriate contamination monitor (see table A1.1) and check the battery status and the last calibration is within 12 months.

2. Note the background radiation level on the monitor away from the work area and enter this number into the background 1 box on the monitoring record. Typical background readings are :

   GM detector e.g. EP15 or type E < 5 cps
   Scintillation detector e.g. 44A 5-15cps

3. Before stating work, monitor the work area, floor in front of experiment area and any equipment to be used. Monitoring should be carried out slowly and methodically with the probe held about 1cm from the surface being checked. Enter the readings into each box (no ditto marks!)

4. If the area is contaminated note this on the monitoring record. Wearing gloves, decontaminate any areas where the reading is more than 2 times the background. Wipe the area using a paper towel and 5% decon solution or other suitable cleaning agent. Dispose of the paper towel as radioactive waste. Monitor the area again and repeat this process until the reading is below the action level and record the result on the record sheet. **If you are unable to decontaminate successfully contact your RPS for advice and ensure no further work is carried out in the area until the issue has been resolved, make a note of this action on the monitoring record.**

5. After completing the work monitor the work surface, floor around work area, the disposal sink and other equipment used in the experiment.

6. Decontaminate any areas if necessary as in 4 above.

7. Finally check your gloved hands and lab coat for contamination and any other locations that may have become contaminated. If you find your gloves are contaminated remove them and dispose as radioactive waste and re-check your hands. If your un-gloved hands are contaminated then wash them without delay using a liquid detergent. Contaminated lab coats or other clothing should be bagged and allowed to decay or disposed of as radioactive waste. **If in doubt ask a colleague to help and follow the contingency plan in the local rules.**

8.

Radionuclide	Contamination Monitor	Action Level
Tritium (H-3)	Wipe Tests	2 times the background reading
Carbon 14	GM detector e.g. EP15; **cap off**	
Sulphur-35		
Iodine-125	44A scintillation monitor	

Table A1.1 Contamination monitor for common radionuclides
If the radionuclide does not appear on the list then check your risk assessment or contact your RPS.

Instructions for monitoring of tritium
Contamination monitors are not sensitive enough to detect the low energy beta radiation emitted by tritium. Monitoring must therefore be done using wipe tests. It is normally assumed that 10% of any contamination will have been transferred to the wipe. The monitoring procedure is similar to that described in A1.1.1 above with wipe tests substituted for monitoring with a contamination monitor.

1. Take 2 swabs (stored in cupboard in lab 4.030) and place each straight into separate scintillation vials with the appropriate quantity of liquid scintillant (4ml for small vials) place vials into rack for beta counter and read using programme 11. These give the background readings and should be entered on the monitoring sheet as background 1 and 2.

2. Before starting work use a swab (moistened with ethanol) to wipe an area of about 100cm^2 for small objects or surfaces and 1000cm^2 for larger surfaces such as benches or floors. Use a separate wipe or swab for each item used.

3. Treat the swab as above. The action level is set at 2 times the average background reading.

4. Decontaminate any areas with readings above the action level as described in 4 above.

5. Take further wipe tests after completing the work, including the work surface, floor area, disposal sink and any other items used.

6. Decontaminate if necessary and record actions on monitoring sheet.

7. **If decontamination was unsuccessful then contact your RPS for advice and ensure no further work is carried out in the area until the issue has been resolved.**

A1.2 Area checks

In addition to the monitoring described above, in labs where long lived radioisotopes are use, checks of a larger area should be undertaken every 2 weeks or after every experiment if work is infrequent. This is to ensure that there is no build up of radioactivity over time. Checks should extend into 'clean' areas and include 2 or 3 random areas of the lab to confirm that there is no contamination outside the normal work areas such as door handles, telephones and fridges. Monitoring should be carried out as shown below:

Radioisotope	**Routine monitoring method**
Tritium (H-3)	Wipe tests, liquid scintillation counter
Carbon-14	
Sulphur-35	
Iodine-125	Wipe tests with gamma counter if available, or scintillation detector.

A plan of rooms 4.030 and 4.034 containing the areas and their code letters will be available on each clipboard in the relevant labs. An entry should be made on the record sheet every time monitoring is carried out, whether contamination is found or not. If a lab is not used for a period of time there is no need to carry out routine contamination checks, but this should be indicated on the record sheet.