INTRODUCTION

1.1 Ionising Radiation Regulations 1985
The Regulations were made under the provisions of the Health and Safety at Work etc Act 1974 and came into force on 1 January 1986. They apply to all work with ionising radiation and are enforced by the Health and Safety Executive. These are the first Regulations covering work with Ionising Radiation that apply directly to the University and its employees. Failure to comply with the Regulations is a criminal offence. The Regulations are supplemented by an Approved Code of Practice (ACOP) which gives details of the way in which the Regulations may be complied with.

Regulation 11(1) requires that written Local Rules be formulated to lay down the general principles and description of the means of complying with the Regulations. The Rules are part of the University’s general safety policy required by the Health and Safety at Work etc Act 1974. The University Rules describe the requirements of the Regulations and, where procedures are applicable to all departments, set out the detailed means of complying with the Regulations. Where procedures are specific to a particular department or area they are described in Departmental Rules. The University Rules together with the Departmental Rules form the Local Rules required by the Regulations.

1.2 Radioactive Substances Act 1960
This Act controls the purchase, storage and disposal of all radioactive substances. Control is exercised by Certificates of Registration which specify maximum stock levels and Certificates of Authorisation which specify routes of disposal as well as maximum quantities for disposal. Copies of the certificates of registration and authorisation are displayed in each department where work with Ionising Radiation takes place. The Act is enforced by the Radiochemical Inspectorate.

1.3 Information
Copies of the legislation referred to above, as well as an extensive collection of documents on radiation protection, are available for reference from the Health and Safety Department.

REGULATION 4 - CO-OPERATION BETWEEN EMPLOYERS
Where an employee of an organisation other than the University visits University premises and is likely to be exposed to Ionising Radiation at the University, then the Departmental Radiation Officer (DRO) of the appropriate department must be notified. The DRO must inform the visitor's employer and provide any necessary information to enable that employer to comply with the Ionising Radiations Regulations. No visitor may be exposed to a dose rate greater than 2.5mSv.hr⁻¹ unless the prior agreement of the University Safety & Radiation Protection Officer (USRPO) has been obtained.

REGULATION 5 - NOTIFICATION OF WORK WITH IONISING RADIATION
The University is required to notify the Health & Safety Executive (HSE) of all work with Ionising Radiation. That notification has already been made in connection with work being undertaken on premises controlled by the University. Where an employee of the University undertakes work with Ionising Radiation at other premises the USRPO must be notified via the DRO.
REGULATION 6 - RESTRICTION OF EXPOSURE TO IONISING RADIATION

4.1 The extent to which persons are exposed to ionising radiation must be restricted so far as is reasonably practicable. The way in which exposure is restricted must be, so far as is reasonably practicable, by engineering or design controls, eg shielding, ventilation and containment.

4.2 Systems of work must be provided to restrict exposure, so far as is reasonably practicable. Appropriate personal protective equipment must be provided unless this will not restrict exposure any further.

4.3 Employees must minimise their own exposure, in particular they must use reasonable care when carrying out work, use any protective equipment provided and report any defects with personal protective equipment or engineering controls.

4.4 All work involving the use of Ionising Radiation must be justified. If equally effective alternative methods of work which are inherently safer are available, then they must be adopted. The experimental technique chosen, if it involves Ionising Radiation must be discussed with the DRO and a written system of work produced.

4.5 No sealed radioactive source may be held in the hand or manipulated directly by hand unless the instantaneous dose rate to the skin of the hand does not exceed 75mSv.hr$^{-1}$.

4.6 No unsealed radioactive substance nor any article containing a radioactive substance may be held in the hand or directly manipulated by hand, so far as is reasonably practicable.

4.7 Priority should be given to the containment of radioactive substances as a means of preventing disposal or contamination rather than apply ventilation.

4.8 There is no level of contamination specified as acceptable. All reasonably practicable measures must be taken to remove contamination.

4.9 No person may eat, drink, smoke, take snuff or apply cosmetics in a radiation area where unsealed radioactive substances are present.
5  **REGULATION 7 - DOSE LIMITS**
The maximum annual dose limits are -

<table>
<thead>
<tr>
<th></th>
<th>Employees aged 18 years or over</th>
<th>Trainees aged under 18 years</th>
<th>Any other person</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whole body</strong></td>
<td>50mSv</td>
<td>15mSv</td>
<td>5mSv</td>
</tr>
<tr>
<td><strong>Individual organs and tissues</strong></td>
<td>500mSv</td>
<td>150mSv</td>
<td>50mSv</td>
</tr>
<tr>
<td><strong>Lens of eye</strong></td>
<td>150mSv</td>
<td>45mSv</td>
<td>15mSv</td>
</tr>
</tbody>
</table>

**Women of reproductive capacity**
Dose limit for abdomen - 13mSv in any consecutive three month interval

**Pregnant women**
Dose limit during the declared term of pregnancy 10mSv

6  **REGULATION 8 - DESIGNATION OF CONTROLLED AND SUPERVISED AREAS**

6.1 The Ionising Radiations Regulations require that any area where an employee may receive a dose of ionising radiation in excess of three-tenths of the annual limit must be designated a Controlled Area. Similarly where the dose may exceed one-tenth of the annual dose limit the area must be designated a Supervised Area. The criteria for deciding whether a dose limit is likely to be exceeded are complex. The DRO will, in consultation with the USRPO, determine whether any areas require the need to designate Controlled Areas or Supervised Areas wherever possible by restricting the extent to which Ionising Radiation is used. In order to achieve this objective the maximum use of Ionising Radiation in any area will be specified in the Departmental Rules.

6.2 Each area where Ionising Radiation is used should normally be designated as a Radiation Area unless it has been designated a Controlled or Supervised Area. Work with Ionising Radiation may only take place outside a designated area with the written agreement of the DRO and must be described in a written scheme of work. NB: Radiation area is an internal University designation

6.3 All designated areas must be described in the Departmental Rules.

6.4 A notice must be placed at all entrances of each designated area indicating the type of designation and the persons who may enter the area. The restrictions on entry are:

<table>
<thead>
<tr>
<th>Type of Area</th>
<th>Persons who may enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled Areas or Supervised Areas</td>
<td>1) Classified persons</td>
</tr>
<tr>
<td></td>
<td>2) Radiation workers - who are working in accordance with a written system of work that ensures that any dose received in any calendar year does not exceed three-tenths (or one-tenth for supervised areas) of any relevant dose limit</td>
</tr>
</tbody>
</table>
Radiation Area  

1) Radiation Workers  
2) A non radiation worker, including cleaners and maintenance staff, who is being closely supervised by a radiation worker who normally works in that area

7 REGULATION 9 - Designation of persons working with Ionising Radiation

7.1 The following persons who use Ionising Radiation at premises controlled by the University must be registered as Radiation Workers with the USRPO

7.1.1 All employees of the University, including student demonstrators

7.1.2 All postgraduate students

7.1.3 All undergraduate students using Ionising Radiation as part of a project which is not part of a supervised laboratory practical

7.1.4 All contractors, visitors or other persons who are not employees of the University unless they are already designated Classified Persons by their employers

Before commencing work with Ionising Radiation the registration form contained in Appendix 1 must be completed and sent to the USRPO via the DRO. The registration form must also be completed by those persons who were working with Ionising Radiation at the University when the Ionising Radiation Regulations came into force.

NOTE: The term Radiation Worker is an internal University designation.

7.2 All employees of the University who work with Ionising Radiation at premises other than those controlled by the University must inform the USRPO in order that arrangements may be made for any necessary dose measurements and records.

7.3 Any Radiation Worker who is likely to receive a dose of Ionising Radiation in excess of three-tenths of any dose limit listed in Section 5 is required by the Ionising Radiation Regulations to be designated a Classified Person. The decision on the likelihood of three-tenths of any dose limit being exceeded will be taken by the DRO in consultation with the USRPO.

7.4 Any Radiation Worker who works in a Controlled Area, unless that work is covered by a written system of work, must be designated a Classified Person. Written schemes of work must ensure that no person may receive a dose of Ionising Radiation in excess of three-tenths of any relevant dose limit.

7.5 No person under 18 years of age may work with Ionising Radiation to the extent that designation as a Classified Person is required.

7.6 NOTE: for the purpose of designation of persons working with Ionising Radiation the use of the following equipment will not require the user to be registered as a Radiation Worker provided the instantaneous dose rate cannot exceed 2.5mSvh$^{-1}$

- electron microscopes
- fully interlocked X-ray equipment

This exclusion does not apply to those persons aligning or maintaining the above equipment.
8  **REGULATION 11 - LOCAL RULES**

The Local Rules, required by the Ionising Radiations Regulations consist of the 'University Rules for Work with Ionising Radiation' and the 'Departmental Rules for Work with Ionising Radiation'.

All Radiation Workers must be given a copy of the University Rules and the appropriate Department Rules.

9  **REGULATION 11 - RADIATION PROTECTION SUPERVISORS**

9.1 Each department that uses Ionising Radiation must appoint a sufficient number of Radiation Protection Supervisors (RPS) to ensure that all work with Ionising Radiation is carried out in accordance with the Ionising Radiations Regulations and the Local Rules.

9.2 The RPS should be directly involved with the work with Ionising Radiation, preferably in a supervisory management position that will enable the exercise of close supervision. The RPS need not be present all the time. The RPS should:

9.2.1 know and understand the requirements of the Ionising Radiations Regulations and the Local Rules as they effect the work they supervise

9.2.2 command sufficient respect from the people doing the work as will allow them to exercise the necessary supervision of radiation protection

9.2.3 understand the necessary precautions to be taken in the work which is being done and the extent to which these precautions will restrict exposures.

9.3 RPSs must be appointed in writing on the recommendation of the Head of Department. The Head of Department should consult the USRPO and the DRO about the suitability of the proposed RPS.

9.4 The name(s) of the RPS(s) must be included in the Departmental Rules along with details of how to contact the RPS in an emergency.

9.5 Each Radiation Worker must be informed by the DRO of the name of the RPS who has the responsibility for ensuring that his work is supervised to ensure compliance with the Ionising Radiation.

10  **REGULATION 12 - INFORMATION, INSTRUCTION AND TRAINING**

10.1 All Radiation Workers must receive adequate information, instruction and training to enable them to conduct their work in accordance with the Ionising Radiations Regulations and the Local Rules. The USRPO will arrange for such training to be made available.

10.2 All Radiation Workers must complete the declaration on training contained in the registration form for Radiation Workers given in Appendix 1.

10.3 Female Radiation workers must be informed of the possible hazard arising from Ionising Radiation to the foetus in early pregnancy and hence the importance of informing the DRO as soon as they discover that they have become pregnant.

10.4 Persons, other than Radiation Workers, who are required to work in a Radiation Area, must be informed of any hazard due to Ionising Radiation and any necessary precautions. Outside contractors and University maintenance personnel fall into this category. The DRO should arrange for the provision of this information.
11 REGULATION 13 - DOSE ASSESSMENT
11.1 All Radiation Workers will be provided with an appropriate dosemeter. In most cases an appropriate dosemeter will mean a film badge. The dosemeter must always be worn in Controlled, Supervised or Radiation Areas.

11.2 When the type of work being undertaken carries the risk of a significant dose to the hands, the Radiation Worker will be issued with a Thermoluminescent Dosemeter (TLD). Persons issued with a TLD must always wear it when a significant dose to the hands is likely.

11.3 When work is undertaken with neutron sources, and the instantaneous neutron dose rate exceeds 2.5mSvh\(^1\), the Radiation Worker will be issued with a fast neutron track dosemeter which must be worn when working with the neutron source.

11.4 Dosemeters will be sent by the USRPO to the DRO on a quarterly basis for film badges and monthly for TLDs and neutron dosemeters. The DRO will issue them to the Radiation Workers. Exposed dosemeters must be returned promptly to the DRO at the end of the period of issue. The DRO will return the dosemeters to the USRPO who will forward them to the Dosimetry Service.

11.5 An assessment of the intake of radionuclides must be made for all Classified Persons who work with unsealed radioactive sources. The type of assessment will be agreed between the USRPO and the Dosimetry Service.

11.6 The USRPO will provide the DROs with copies of the dose records received from the Dosimetry Service. The USRPO will also keep copies of the dose records received from the Dosimetry Service for three years.

11.7 Any Classified Person who ceases to work at the University must inform the USRPO via the DRO in order that a termination record can be obtained.

11.8 If a dosemeter is lost or destroyed the USRPO will, in consultation with the DRO, estimate the dose received and arrange for the estimated dose to be entered in the dose record.

12 REGULATION 14 - ACCIDENT DOSIMETRY
If a Radiation Worker suspects that they have been exposed to a radiation dose in excess of three-tenths of any relevant dose limit (section 5) they must inform the DRO and USRPO. The USRPO will, in consultation with the DRO, arrange for an estimate of the dose received to be made. The USRPO will keep a record of such estimates for at least 50 years.

13 REGULATION 16 - MEDICAL SURVEILLANCE
13.1 All Classified Persons, and any person who has received a dose of Ionising Radiation in excess of any relevant dose limit, will be subjected to medical surveillance. Before being designated a Classified Person, a medical examination must be carried out and the person certified fit to work with Ionising Radiation.

13.2 The USRPO will arrange with the University Medical Officer for the carrying out of medical surveillance and the keeping of records.

14 REGULATION 18 - SEALED SOURCES AND ARTICLES CONTAINING OR EMBODYING RADIOACTIVE SUBSTANCES
14.1 Where a radioactive substance is used as a source of Ionising Radiation the substance should be in the form of a sealed source if this is reasonably practicable.

14.2 The design, construction and maintenance of any article containing a radioactive substance, including its bonding, immediate container or other mechanical protection must prevent the leakage of any radioactive substance.
14.3 All sealed radioactive sources must be tested for leakage at a frequency not less than every 26 months. If damage to a sealed source is suspected, an additional leakage test must be carried out.

14.4 The USRPO will arrange for this testing to be carried out. The charges made by the organisation carrying out the test will be passed on to the relevant departments.

14.5 Records of leakage testing will be kept by the USRPO for a minimum period of 3 years.

15 REGULATION 19 - ACCOUNTING FOR RADIOACTIVE SOURCES (RECORDS)

15.1 A written record must be kept by the DRO of all radioactive substances present in his Department. The record must be kept for at least 2 years from the date the record was made or at least 2 years from the disposal of that radioactive substance. It is the responsibility of the person who arranges for a radioactive substance to be brought onto University premises, to inform the DRO and to record the acquisition on the record sheet kept for this purpose. In the case of unsealed sources the person removing any radioactive substance from the original source container must make the appropriate entry on the record sheet.

15.2 The records must be such as to ensure that the whereabouts of radioactive substances are known and losses of significant quantities are identified quickly.

The Ionising Radiation Regulations require that the loss or theft of a specified quantity of an isotope be notified to the Health & Safety Executive. Different quantities are specified for each isotope dependent upon its radiotoxicity. Values for isotopes in use at the University are given in Appendix 2.

In order to determine that such a loss has taken place the records of radioactive substances must identify clearly all containers. The containers must be identifiable with the original batch until the dilution of the original radioactive substance results in less than the amount of the isotope specified in Appendix 3 being present in a single container.

15.3 A check must be made at the frequencies given below to ensure that the accounting record is a true record. A written record of such checks must be kept by the DRO. The frequencies of the checks are:

| Sealed sources | Normally locked in safe or cupboard | Monthly |
| Unsealed sources | - used in laboratory practicals | Daily |

| - | - | Annually |

16 REGULATION 19 - ACQUISITION OF RADIOACTIVE SUBSTANCE

16.1 All orders for radioactive substances must be authorised and countersigned by the DRO.

16.2 The DRO may authorise orders for his department provided that the total quantity of radioactive substances ordered in any calendar month does not exceed the amount specified in Appendix 3. If it is proposed to order a quantity of radioactive substance which will exceed this limit the written consent of the USRPO must be obtained prior to placing the order. If the total quantity of radioactive substance held by the
University approaches the level permitted by the Certificate of Authorisation the USRPO may impose restrictions on ordering until the situation is remedied.

16.3 A copy of all orders must be sent to the USRPO.

16.4 The USRPO will keep a record of all radioactive substances irrespective of whether a payment is made.

16.5 The above requirements apply to all radioactive substances irrespective of whether a payment is made.

16.6 The USRPO must be notified in writing of any radioactive substance transferred from one department to another.

17 REGULATION 19 - ACCOUNTING FOR RADIOACTIVE SOURCES (DISPOSALS)

RADIOACTIVE SUBSTANCES ACT - SECTION 6 & 7

The quantities of radioactive material that may be disposed of during each month are controlled by authorisations made under the Radioactive Substances Act. The maximum monthly disposals for each department are listed in Appendix 5. The holdings of radioactive material should be kept to a minimum consistent with current requirements. All unwanted material should be disposed of. The permitted routes for disposal of radioactive substances are:

17.1 Liquid Waste

17.1.1 Aqueous waste may be discharged to the drainage system either through designated sinks or designated macerators. Sinks and macerators so designated are described in the Departmental Rules.

17.1.2 Non-water miscible organic solvent waste is to be collected in suitable leak proof containers and then transported to the University Waste Store. The containers should be taken to the University Waste Store by the Department after arranging a suitable time with the USRPO. Containers must always be clearly labelled to indicate:

   i) Isotope(s)
   ii) Total activity of each isotope present - Bq
   iii) Volume
   iv) Non radioactive constituents, eg. type of solvent
   v) Date removed to waste store

17.1.3 The system of labelling chosen must not permit the accidental erasure or removal of information if solvent is spilt on the label.

17.2 Solid Waste

Solid Waste which is below the level of activity given in Appendix 4 is regarded as low level waste and may be disposed of in dustbins marked for this purpose.

If the level of activity exceeds that given in Appendix 4 it must be taken to the University Waste Store by the Department after arranging a suitable time with the USRPO. Containers must be clearly and indelibly labelled to indicate:

   i) Isotope
   ii) Total activity of each isotope - Bq
   iii) Non-radioactive contents - eg gloves, benchcoat, etc.
   iv) Date removed to store

Before any solid waste is generated, where the level of activity exceeds that given in Appendix 5, the need to generate the waste must be agreed with the USRPO.
17.3 Gaseous Waste
All gaseous discharges of radioactive material are authorised individually. Details of the authorised discharges are given in Appendix 5. No other gaseous discharges are permitted unless prior authorisation has been obtained from the Radiochemical Inspectorate via the USRPO.

17.4 Records of waste disposal
17.4.1 All disposals of aqueous waste down designated sinks and macerators must be recorded in a record book. The location of the record book must be indicated by a notice adjacent to the disposal point. It is the responsibility of the person carrying out the disposal to enter the details in the book.

17.4.2 All disposals of low activity waste to the dustbins emptied by the Local Authority must be recorded in a record book. It is the responsibility of the person carrying out the disposal to enter the details in the book.

17.4.3 All removals of waste to the waste store must be recorded in a record book by the DRO. It is the responsibility of the person generating the waste to inform the DRO of the nature and quantity of the waste.

17.4.4 All discharges of gaseous waste must be recorded in a record book kept adjacent to the points of discharge. It is the responsibility of the person carrying out the disposal to enter details in the book.

17.4.6 The USRPO must be notified in writing of the removal of any radioactive substances from University premises for purposes other than disposal. An example would be if a radioactive substance were transferred to another University.

18 REGULATION 20 - KEEPING OF RADIOACTIVE SUBSTANCES
18.1 Radioactive substances must be kept in suitable receptacles when not in use. The receptacle chosen must ensure effective restriction of exposure to ionising radiations and control against dispersal. Criteria to be taken into account when considering the suitability of the receptacle are:

18.1.1 the corrosivity of the radioactive substance and the storage environment;
18.1.2 the pyrophoricity of the radioactive substance;
18.1.3 any anticipated pressure build-up inside the receptacle;
18.1.4 the degree of fire resistance of the receptacle;
18.1.5 the dispersibility of the radioactive substance, eg. powders should be sealed in a container such as a plastic bag and placed in another container to prevent damage to the bag and provide shielding;
18.1.6 the need to provide shielding from Ionising Radiation;
18.1.7 the ability of the receptacle to withstand damage from foreseeable use or misuse.

18.2 All radioactive substances must be kept in a suitable store when not in use. The store must provide:

18.2.1 protection from the effects of the weather;
18.2.2 resistance to fire sufficient to minimise dispersal and minimise loss of shielding, taking into account the combustibility of surrounding materials and the likely temperature that would be reached in the event of a fire;

18.2.3 shielding to ensure that the instantaneous dose rate at the outside of the store does not exceed $2.5 \text{ mSvh}^{-1}$. Where radioactive substances are stored in cupboards, refrigerators or similar containers outside the cupboard, etc is to be considered as the outside of the store NOT the outside of the room in which the cupboards, etc is situated;

18.2.4 ventilation to prevent significant accumulations of gases and vapours (whether radioactive or not) or of any accidentally dispersed radioactive substance. All receptacles containing gaseous radioactive substances must be stored in a fume cupboard or similar containment having permanent mechanical ventilation;

18.2.5 proper physical security such that access is only normally possible to Radiation Workers authorised by the DRO to enter the store;

18.2.6 storage only for radioactive substances, their containers and ancillary items such as handling tools and shielding material. Nothing explosive or highly flammable may be kept in the store;

18.2.7 indication, in the form of a prominent sign, that the store may contain radioactive substances. Suitable signs may be obtained from the USRPO.

19 REGULATION 21 - TRANSPORT AND MOVING OF RADIOACTIVE SUBSTANCES

19.1 Moving of Radioactive Substances within a building

Whenever a radioactive substance is moved within a building it must be kept in a suitable receptacle while it is moved.

19.2 Transport of Radioactive Substances on the University Site

When a radioactive substance is taken outside a building, whether by hand or on a conveyance, but is not taken off the University site, the following requirements apply:

19.2.1 the radioactive substance must be in a suitable receptacle which

(a) provides adequate shielding - the dose rate at the surface of the receptacle must not exceed $2.5 \text{ mSvh}^{-1}$

(b) is appropriate for the distance through which it will be moved

(c) gives protection against spillage or dispersal

19.2.2 the receptacle must be accompanied by written information about the contents which includes

(a) the radioisotope(s) present

(b) the quantity (Bq)

(c) the physical form

(d) any additional information which would be required to enable the person opening it to do so safely.
19.3 Transport of Radioactive Substances off the University Site

If a radioactive substance is to be taken off the University site the USRPO must be consulted to ensure that all legislation applicable to transport is complied with.

20 REGULATION 22 - WASHING AND CHANGING FACILITIES
If an area has been designated as a Controlled or Supervised Area by reason of the risk of internal radiation, adequate washing and changing facilities must be provided. Whilst not specifically required by the Ionising Radiations Regulations, it is desirable that hand washing facilities are provided in Radiation Areas where unsealed radioactive substances are handled. Advice about such facilities may be obtained from the USRPO.

21 REGULATION 23 - PERSONAL PROTECTIVE EQUIPMENT
21.1 Where respiratory protective equipment is provided for use in a Controlled or Supervised Area it must be of a type approved by the Health and Safety Executive and properly maintained. Advice on such equipment and its maintenance may be obtained from the USRPO.

21.2 All radiation workers must wear suitable protective clothing when working with radioactive substances, eg:

- a laboratory coat must always be worn when unsealed radioactive sources are handled
- gloves should be worn when there is a risk of hands becoming contaminated

22 REGULATION 24 - MONITORING OF LEVELS FOR RADIATION AND CONTAMINATION
22.1 Levels of Ionising Radiation must be adequately monitored to ensure that the measures taken to restrict the exposure of persons to Ionising Radiation are adequate. It is not permitted to use the assessed doses of individuals, eg via film badges, to carry out this monitoring. Monitoring also confirms that areas have been correctly designated.

22.2 Suitable monitoring procedures must be in place.

22.3 Suitable monitoring instruments must be readily available for use whenever work with Ionising Radiation is undertaken.

22.4 All monitoring instruments must be properly maintained. Checks on the battery and zeroing of instruments must be carried out at frequent intervals. A check for lack of response must be made each time the instrument is used. This may be achieved by exposing the instrument to a known radioactive source. Monitoring instruments must also be thoroughly inspected and examined at least once in every 14 months. The USRPO will arrange for this to be carried out and the cost charged to the appropriate department.

22.5 All new monitoring instruments must have their performance established by tests before being brought into use. Before any new monitoring instrument is purchased the USRPO must be consulted.

22.6 Written records must be kept of monitoring carried out and of the tests described in 22.4 and 22.5. The records of monitoring must be kept by the DRO for a period of at least 2 years from the date on which they were made. The USRPO will keep records of the tests described in 22.4 and 22.5 for at least 2 years.
23 REGULATION 25 - ASSESSMENT OF HAZARDS
23.1 An assessment of the nature and magnitude of the radiation hazard which is likely to arise in the event of a reasonably foreseeable accident, occurrence or incident must be made before commencing any work with Ionising Radiation. This assessment should be part of the written system of work required in 4.4.

23.2 The written system of work should indicate the steps to be taken to prevent any such incident but also include details of the means of limiting the consequences if the incident does occur.

24 REGULATION 27 - CONTINGENCY PLANS
24.1 If the assessment described in paragraph 23 indicates that, as a result of any foreseeable accident, occurrence or incident:

(a) any person is likely to receive a dose of Ionising Radiation which exceeds any relevant dose limit
OR
(b) an area, which is not already designated as a Controlled Area would have to be so designated

then a contingency plan must be written. This contingency plan must restrict, so far as is reasonably practicable, the exposure to Ionising Radiation of persons who may be affected by the incident.

24.2 Where the emergency services may be part of the contingency plan they must be consulted in the preparation of the plan. The DRO should notify the USRPO who will arrange for such consultation to take place.

24.3 The contingency plan must include.

24.3.1 arrangements for all persons likely to be affected by the incident

24.3.2 the name of the person responsible for safety. In most cases this will be the Head of Department

24.3.3 the names of the persons responsible for carrying out tasks associated with the plan.

24.4 The contingency plan must be included in the Departmental Rules

25 REGULATION 28 - INVESTIGATION OF EXPOSURE
If there is reason to suspect that any person has been exposed to Ionising Radiation in excess of 15mSv for the first time in any calendar year an investigation must be made to ensure that the requirements of regulation 6 are being met. The USRPO will arrange for the written report of such investigations to be kept for at least 2 years.

26 REGULATION 29 - INVESTIGATION AND NOTIFICATION OF OVEREXPOSURE
26.1 If there is reason to suspect that a relevant dose limit has been exceeded an investigation must take place. Should the investigation conclude that the overexposure could have occurred then the Health and Safety Executive must be notified. The USRPO will arrange for such investigation and notification to be carried out.

26.2 Where any person suspects that an overexposure has occurred he must inform the USRPO immediately.
REGULATION 31 - NOTIFICATION OF CERTAIN OCCURRENCES

27.1 If a quantity of radioactive is spilt or released into the atmosphere the USRPO must be informed in order that the Health and Safety Executive may be notified.

27.2 If a quantity of radioactive substance is lost or stolen the USRPO must be informed in order that the Health & Safety Executive may be notified.

27.3 The USRPO will arrange for an investigation should either of the above incidents occur. The USRPO will also arrange for a report of the investigation to be kept for at least 50 years.

REGULATION 34 - MISUSE OF OR INTERFERENCE WITH SOURCES OF IONISING RADIATION

It is a criminal offence to intentionally or recklessly misuse or, without reasonable excuse, interfere with any radioactive substance or radiation generator.
REGISTRATION OF RADIATION WORKER

I intend to carry out work involving the use of Ionising Radiation and, in accordance with the Local Rules of the University request to be designated a Radiation Worker.

NAME: (please print) ..................................................................................................................................

DEPARTMENT: ..............................................................................................................................................

Room No: .......................................................... Telephone Ext: ..............................................................

Staff/ Postgraduate Student/ Undergraduate Student/ Other (Please specify) .............................................................

Declarations

I have received a copy of both the University Rules and the Departmental Rules for Work with Ionising Radiation. I agree to conduct my work in accordance with these Rules.

* I have received adequate information, instruction and training to enable me to conduct my work in accordance with the Ionising Radiations Regulations and the Local Rules. Details of the training and/or experience that I have received in the use of Ionising Radiations are :

<table>
<thead>
<tr>
<th>Place</th>
<th>Date</th>
<th>Nature of Training/Experience</th>
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* I have not received adequate training in the use of Ionising Radiation and request that such training be provided

(* Delete whichever statement is incorrect)

Signature: .......................................................................................................................... Date: ..................................

In the case of a student the academic supervisor must also sign below to confirm that the above details are correct to the best of their knowledge.

(Academic Supervisors are reminded that they are responsible for ensuring that the student carries out his work with Ionising Radiation in accordance with the Local Rules)

Signature: .......................................................................................................................... Date: ..................................

This form should be given to the Departmental Radiation Officer who will forward it to the University Safety & Radiation Protection Officer.
NOTIFICATION OF LOSS OR THEFT OF RADIOACTIVE SUBSTANCES

The Ionising Radiations Regulations 1985 require the loss or theft of a radioactive substance to be notified to the Health & Safety Executive if the amount exceeds the value for that isotope given in column 2 of schedule 2 of the Regulations. A list of the values for the isotopes in common use at the University is given below. The value for isotopes not listed can be obtained from the Regulations or from the University Safety & Radiation Protection Officer (USRPO).

It should be noted that there is no similar lower limit specified in the authorisations to keep radioactive substances given under the Radioactive Substances Act. Any loss or theft should be reported to the USRPO.

<table>
<thead>
<tr>
<th>Isotope</th>
<th>Minimum value for notification under the Ionising Radiations Regulations (kBq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americium - 241</td>
<td>5</td>
</tr>
<tr>
<td>Americium - 243</td>
<td>5</td>
</tr>
<tr>
<td>Barium - 133</td>
<td>500</td>
</tr>
<tr>
<td>Cadmium - 109</td>
<td>50</td>
</tr>
<tr>
<td>Caesium - 137</td>
<td>500</td>
</tr>
<tr>
<td>Calcium - 45</td>
<td>500</td>
</tr>
<tr>
<td>Carbon - 14</td>
<td>500</td>
</tr>
<tr>
<td>Cerium - 139</td>
<td>500</td>
</tr>
<tr>
<td>Chlorine - 36</td>
<td>500</td>
</tr>
<tr>
<td>Cobalt - 57</td>
<td>50</td>
</tr>
<tr>
<td>Cobalt - 60</td>
<td>50</td>
</tr>
<tr>
<td>Curium - 244</td>
<td>5</td>
</tr>
<tr>
<td>Europium - 152</td>
<td>50</td>
</tr>
<tr>
<td>Hydrogen - 3</td>
<td>5,000</td>
</tr>
<tr>
<td>Iron - 55</td>
<td>500</td>
</tr>
<tr>
<td>Lead - 210</td>
<td>5</td>
</tr>
<tr>
<td>Manganese - 54</td>
<td>500</td>
</tr>
<tr>
<td>Mercury - 203</td>
<td>500</td>
</tr>
<tr>
<td>Nickel - 63</td>
<td>500</td>
</tr>
<tr>
<td>Phosphorus - 32</td>
<td>500</td>
</tr>
<tr>
<td>Plutonium - 236</td>
<td>5</td>
</tr>
<tr>
<td>Plutonium - 238</td>
<td>5</td>
</tr>
<tr>
<td>Plutonium - 239</td>
<td>5</td>
</tr>
<tr>
<td>Plutonium - 242</td>
<td>5</td>
</tr>
<tr>
<td>Radium - 226</td>
<td>5</td>
</tr>
<tr>
<td>Sodium - 22</td>
<td>500</td>
</tr>
<tr>
<td>Strontium - 85</td>
<td>500</td>
</tr>
<tr>
<td>Strontium - 90</td>
<td>50</td>
</tr>
<tr>
<td>Sulphur - 35</td>
<td>5,000</td>
</tr>
<tr>
<td>Thorium - 228</td>
<td>5</td>
</tr>
<tr>
<td>Tin - 113</td>
<td>500</td>
</tr>
<tr>
<td>Tritium</td>
<td>5,000</td>
</tr>
<tr>
<td>Uranium - 23 3</td>
<td>5</td>
</tr>
<tr>
<td>Uranium - 238</td>
<td>5,000</td>
</tr>
<tr>
<td>Yttrium - 88</td>
<td>500</td>
</tr>
<tr>
<td>Yttrium - 90</td>
<td>500</td>
</tr>
</tbody>
</table>

5 kBq = 135 nCi  
50 kBq = 1.35 mCi  
500 kBq = 13.5 mCi  
5,000 kBq = 135 mCi
Appendix 3

Maximum quantity of radioactive substance that a department may purchase or otherwise acquire each month without reference to the University Safety and Radiation Protection Officer

<table>
<thead>
<tr>
<th>Source Type</th>
<th>All Radionuclides (excluding tritium and alpha emitters)</th>
<th>Alpha Emitters</th>
<th>Tritium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsealed sources</td>
<td>200 MBq (5.4mCi)</td>
<td>10 kBq (270nCi)</td>
<td>800 MBq (21.6mCi)</td>
</tr>
<tr>
<td>Sealed sources</td>
<td>Any radionuclide</td>
<td></td>
<td>370 MBq (10mCi)</td>
</tr>
</tbody>
</table>
4

AUTHORISED DISPOSAL ROUTES FOR RADIOACTIVE SUBSTANCES

1 Limits on the disposal of solid waste
Solid radioactive waste must accompany refuse that is not radioactive when it is removed from the University premises. Solid radioactive waste may be placed in the dustbins emptied by the Local Authority provided the limits listed below are not exceeded.

<table>
<thead>
<tr>
<th>Total of all radionuclides excluding Alpha emitters, Tritium and Carbon-14</th>
<th>Maximum activity in any 0.1m³ of waste</th>
<th>maximum activity in any one article</th>
</tr>
</thead>
<tbody>
<tr>
<td>400kBq (10.8mCi)</td>
<td>40kBq (1.8mCi)</td>
<td></td>
</tr>
</tbody>
</table>

2 Limits on the disposal of aqueous radioactive waste
Aqueous radioactive waste may be disposed of via the sinks and macerators designated in the Departmental Rules. The maximum quantity that may be disposed of by each department in a calendar month is:

- Total radionuclides excluding alpha emitters, Carbon-14 and Tritium: 100MBq (2.7mCi)
- Carbon-14 and Tritium: 5GBq (135mCi)
- Alpha emitters: 5kBq (135nCi)

If it is considered necessary to exceed these limits the Departmental Radiation Officer (DRO) should contact the USRPO to determine whether the proposed disposal will be within the overall University authorisation.

3 Non water miscible solvent
Non water miscible solvent must be taken to the University Waste Store as described in 17.1.2 of these Rules. In addition to the requirements contained in this section of the Rules the following conditions also apply:

i) the dose rate at the surface of the container must be measured. Unless the isotopes present all have half lives of less than one month the dose rate at the surface of the container must not exceed 5mSv (0.5mrem)hr⁻¹. If this dose rate is exceeded non returnable shielding may be required.

ii) the level of contamination on the surface of the container must be measured. The non fixed contamination must not exceed 3.7 Bq cm⁻² (10⁻⁴mCi cm⁻²) for beta & gamma emitters

0.37Bq cm⁻² (10⁻⁵mCi cm⁻²) for alpha emitters

When carrying out the measurement of surface contamination the result may be averaged over an area of 300cm² and it is assumed that 10% of the non-fixed contamination is removed from the area swabbed.
4 Gaseous Waste
The only authorised discharges of gaseous waste are:

(i) the maximum quantity of carbon-14 that can be discharged through the fume cupboard is 20MBq(540mCi) in any one month. The Carbon-14 must only originate from an experiment involving the keeping of plants in a closed system.

(ii) the maximum quantity of Carbon-14 that can be discharged directly into the atmosphere during the use of a leaf labelling apparatus is 5MBq(135mCi) in any one month.

(iii) the maximum quantity of tritium and tritiated water vapour that can be discharged through the fume cupboard is 200MBq(54mCi) in any month and no more than 400MBq(108mCi) in any year.

The USRPO should be informed of any proposed discharges of gaseous waste other than those listed above as a specific authorisation from the Radiochemical Inspectorate should be required.