Regulations made under s. 2 of the Health Protection (Ionising Radiation) Act 1995, and s. 23 of the Interpretation and General Clauses Act.

IONISING RADIATION REGULATIONS 2004

(LN. 2004/088)

13.9.2004

Amending enactments	Relevant current provisions	Commencement date
LN. 2007/005	rr. 6(1)(d) & (e), 56 – 63, Schs. 9 & 10	18.1.2007
Act. 2016-20	r. 43(2)	13.10.2016

EU Legislation/International Agreements involved:
Directive 90/641/Euratom
Directive 96/29/Euratom
Directive 97/43/Euratom
Directive 2003/122/Euratom

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IONISING RADIATION REGULATIONS 2004

Subsidiary 2004/088

In exercise of the powers conferred upon it by section 2 of the Health Protection (Ionising Radiation) Act 1995, and section 23 of the Interpretation and General Clauses Act and of all other enabling powers, and for the purpose of implementing in the law of Gibraltar Council Directives 90/641/Euratom, 96/29/Euratom and 97/43/Euratom, the Government has made the following Regulations–

PART I
PRELIMINARY

Citation and commencement.

1. These Regulations may be cited as the Ionising Radiation Regulations 2004 and come into operation on the 13 September 2004.

Interpretation.

2.(1) In these Regulations, unless the context otherwise requires-

"the 1995 Regulations" means the Ionising Radiation Regulations 1995;

"accelerator" means an apparatus or installation in which particles are accelerated and which emits ionising radiation with an energy higher than 1MeV;

"appointed doctor" means, subject to regulation 52(5) (which is a transitional provision), a registered medical practitioner who is for the time being appointed in writing by the competent authority, for the purposes of these Regulations;

"approved" means approved for the time being in writing for the purposes of these Regulations by the competent authority and published in such form as the authority considers appropriate;

"approved dosimetry service" means, subject to regulation 52(3) (which is a transitional provision), a dosimetry service approved in accordance with regulation 37;

"calendar year" means a period of 12 calendar months beginning with the 1st January;

"classified person" means-

(a) a person designated as such, pursuant to regulation 22(1); and

(b) in the case of an outside worker employed by an undertaking in Great Britain, Northern Ireland or in another member State, a

person who has been designated as a Category A exposed worker within the meaning of Article 21 of the Directive;

"comforter and carer" means an individual who (other than as part of his occupation) knowingly and willingly incurs an exposure to ionising radiation resulting from the support and comfort of another person who is undergoing or who has undergone any medical exposure;

"competent authority" means the person appointed in writing (by notice in the Gazette) by the Minister, for the purposes of these Regulations;

"contamination" means the contamination by any radioactive substance of any surface (including any surface of the body or clothing) or any part of absorbent objects or materials or the contamination of liquids or gases by any radioactive substance;

"controlled area" means-

(a) in the case of an area situated in Gibraltar, an area which has been so designated in accordance with regulation 17(1); and

(b) in the case of an area situated in Great Britain, Northern Ireland or in another member State, an area subject to special rules for the purposes of protection against ionising radiation and to which access is controlled as specified in Article 19 of the Directive;

"the Directive" means Council Directive 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation;

"dose" means, in relation to ionising radiation, any dose quantity or sum of dose quantities mentioned in Schedule 4;

"dose assessment" means the dose assessment made and recorded by an approved dosimetry service in accordance with regulation 23;

"dose constraint" means a restriction on the prospective doses to individuals which may result from a defined source;

"dose limit" means, in relation to persons of a specified class, the limit on effective dose or equivalent dose specified in Schedule 4 in relation to a person of that class;

"dose rate" means, in relation to a place, the rate at which a person or part of a person would receive a dose of ionising radiation from external radiation if he were at that place being a dose rate at that place averaged over one minute;

"dose record" means, in relation to a person, the record of the doses received by that person as a result of his exposure to ionising radiation, being the record made and maintained on behalf of the employer by the approved dosimetry service in accordance with regulation 23;

"external radiation" means, in relation to a person, ionising radiation coming from outside the body of that person;

"health record" means, subject to regulation 52(7) (which is a transitional provision), in relation to an employee, the record of medical surveillance of that employee maintained by the employer in accordance with regulation 26(3);

"internal radiation" means, in relation to a person, ionising radiation coming from inside the body of that person;

"ionising radiation" means the transfer of energy in the form of particles or electromagnetic waves of a wavelength of 100 nanometres or less or a frequency of 3×10^{15} hertz or more capable of producing ions directly or indirectly;

"local rules" means rules made in accordance with regulation 19(1);

"maintained", where the reference is to maintaining plant, apparatus, equipment or facilities, means maintained in an efficient state, in efficient working order and good repair;

"medical exposure" means exposure of a person to ionising radiation for the purpose of his medical or dental examination or treatment which is conducted under the direction of a suitably qualified person and includes any such examination for legal purposes and any such examination or treatment conducted for the purposes of research;

"member State" means a member State of the Communities;

"the Minister" means the Minister with responsibility for the Environment;

"outside worker" means a classified person who carries out services in the controlled area of any employer (other than the controlled area of his own employer);

"overexposure" means any exposure of a person to ionising radiation to the extent that the dose received by that person causes a dose limit relevant to that person to be exceeded or, in relation to regulation 28(2) causes a proportion of a dose limit relevant to any employee to be exceeded;

"practice" means work involving-

(a) the production, processing, handling, use, holding, storage, transport or disposal of radioactive substances; or

(b) the operation of any electrical equipment emitting ionising radiation and containing components operating at a potential difference of more than 5kV,

which can increase the exposure of individuals to radiation from an artificial source, or from a radioactive substance containing naturally occurring radionuclides which are processed for their radioactive, fissile or fertile properties;

"radiation accident" means an accident where immediate action would be required to prevent or reduce the exposure to ionising radiation of employees or any other persons;

"radiation employer" means an employer who in the course of a trade, business or other undertaking carries out work with ionising radiation and, for the purposes of regulations 6, 7 and 8, includes an employer who intends to carry out such work;

"radiation passbook" means–

(a) in the case of an outside worker employed by an employer in Gibraltar–

(i) a passbook approved by the competent authority for the purpose of these Regulations; or

(ii) a passbook to which regulation 52(4) (which is a transitional provision) applies; and

(b) in the case of an outside worker employed by an employer in Great Britain, Northern Ireland or in another member State, a passbook authorised by the competent authority for Great

Britain, Northern Ireland or that other member State, as the case may be;

"radiation protection adviser" means, subject to regulation 52(6) (which is a transitional provision), an individual who, or a body which, meets such criteria of competence as may from time to time be specified in writing by the competent authority;

"radioactive substance" means any substance which contains one or more radionuclides whose activity cannot be disregarded for the purposes of radiation protection;

"sealed source" means a source containing any radioactive substance whose structure is such as to prevent, under normal conditions of use, any dispersion of radioactive substances into the environment, but it does not include any radioactive substance inside a nuclear reactor or any nuclear fuel element;

"Secretary of State" means Her Majesty's Secretary of State for Defence;

"short-lived daughters of radon 222" means polonium 218, lead 214, bismuth 214 and polonium 214;

"supervised area" means an area which has been so designated by the employer in accordance with regulation 18;

"trainee" means a person aged 16 years or over (including a student) who is undergoing instruction or training which involves operations which would, in the case of an employee, be work with ionising radiation;

"transport" means, in relation to a radioactive substance, carriage of that substance on a road within the meaning of section 2(1) of the Traffic Act or through another public place (whether on a conveyance or not), or by sea or air and, in the case of transport on a conveyance, a substance shall be deemed as being transported from the time that it is loaded onto the conveyance for the purpose of transporting it until it is unloaded from that conveyance, but a substance shall not be considered as being transported if-

(a) it is transported by means of a pipeline or similar means; or

(b) it forms an integral part of a conveyance and is used in connection with the operation of that conveyance;

"woman of reproductive capacity" means a woman who is made subject to the additional dose limit for a woman of reproductive capacity

specified in paragraphs 5 and 11 of Schedule 4 by an entry in her health record made by an appointed doctor;

"work with ionising radiation" means work to which these Regulations apply by virtue of regulation 3(1).

(2) In these Regulations, unless the context otherwise requires, any reference to-

(a) an employer includes a reference to a self-employed person and any duty imposed by these Regulations on an employer in respect of his employee shall extend to a self-employed person in respect of himself;

(b) an employee includes a reference to-

(i) a self-employed person, and

(ii) a trainee who but for the operation of this paragraph and subregulation (3) would not be classed as an employee;

(c) exposure to ionising radiation is a reference to exposure to ionising radiation arising from work with ionising radiation;

(d) a person entering, remaining in or working in a controlled or supervised area includes a reference to any part of a person entering, remaining in or working in any such area.

(3) For the purposes of these Regulations-

(a) the word "work" shall include any instruction or training which a person undergoes as a trainee and the meaning of "at work" shall be construed accordingly; and

(b) a trainee shall, while he is undergoing instruction or training in respect of work with ionising radiation, be treated as the employee of the person whose undertaking (whether for profit or not) is providing that instruction or training and that person shall be treated as the employer of that trainee except that the duties to the trainee imposed upon the person providing instruction or training shall only extend to matters under the control of that person.

(4) In these Regulations, where reference is made to a quantity specified in Schedule 8, that quantity shall be treated as being exceeded if-

(a) where only one radionuclide is involved, the quantity of that radionuclide exceeds the quantity specified in the appropriate entry in Schedule 8; or

(b) where more than one radionuclide is involved, the quantity ratio calculated in accordance with Part II of Schedule 8 exceeds one.

(5) Nothing in these Regulations shall be construed as preventing a person from entering or remaining in a controlled area or a supervised area where that person enters or remains in any such area–

(a) in the due exercise of a power of entry conferred on him by or under any enactment; or

(b) for the purpose of undergoing a medical exposure.

(6) In these Regulations-

(a) any reference to an effective dose means the sum of the effective dose to the whole body from external radiation and the committed effective dose from internal radiation; and

(b) any reference to equivalent dose to a human tissue or organ includes the committed equivalent dose to that tissue or organ from internal radiation.

Application.

3.(1) These Regulations shall apply to-

(a) any practice;

(b) any work (other than a practice) carried out in an atmosphere containing radon 222 gas at a concentration in air, averaged over any 24 hour period, exceeding 400 Bq m^{-3} except where the concentration of the short lived daughters of radon 222 in air averaged over any 8 hour working period does not exceed 6.24×10^{-7} Jm^3; and

(c) any work (other than work referred to in paragraphs (a) and (b)) with any radioactive substance containing naturally occurring radionuclides.

(2) The following regulations shall not apply where the only work being undertaken is that referred to in paragraph (b) of subregulation (1), namely regulations 24, 29 to 32, 34 and 35.

(3) The following regulations shall not apply in relation to a person undergoing a medical exposure, namely regulations 8, 9, 12, 17 to 20, 25, 27 and 36(1).

(4) Regulation 12 (dose limitation) shall not apply in relation to any comforter and carer.

(5) In the case of an outside worker (working in a controlled area in Gibraltar) employed by an employer established in Great Britain, Northern Ireland or in another member State it shall be sufficient compliance with regulation 23 (dose assessment and recording) and regulation 26 (medical surveillance) if the employer complies with-

(a) where the employer is established in Great Britain, regulations 21 and 24 of the lonising Radiation Regulations 1999;

(b) where the employer is established in Northern Ireland, regulations 21 and 24 of the Ionising Radiation (Northern Ireland) Regulations 2000; or

(c) where the employer is established in another member State, the legislation in that State which implements Chapters II and III of Title VI of the Directive, where such legislation exists.

Duties under the Regulations.

4. Any duty imposed by these Regulations upon an employer in respect of the exposure to ionising radiation of persons other than his employees shall be imposed only in so far as the exposure of those persons to ionising radiation arises from work with ionising radiation undertaken by that employer.

PART II

GENERAL PRINCIPLES AND PROCEDURES

Justification of types of practice.

5.(1) No person shall carry out any practice resulting in exposure to ionising radiation which falls within a new class or type of practice unless the Minister has determined in writing that that new class or type of practice is justified by its economic, social or other benefits in relation to the health detriment it may cause.

(2) Whenever new and important evidence as to the efficacy or consequences of an existing class or type of practice is acquired by the

Minister, he may review that class or type of practice in order to determine whether it is justified by its economic, social or other benefits in relation to the health detriment it may cause.

(3) Where, pursuant to subregulation (2), the Minister determines that an existing class or type of practice is not justified, he shall prohibit in writing the carrying on of that class or type of practice and, subject to subregulation (4), thereafter no person shall carry on any practice which falls within that class or type of practice.

(4) The Minister may make any prohibition pursuant to subregulation (3) subject to such incidental or transitional provisions as he considers appropriate.

(5) The Minister shall take such steps as he considers appropriate to make public-

(a) any determination made pursuant to subregulation (1); or

(b) any prohibition made pursuant to subregulation (3).

(6) Prior to determining whether a new class or type of practice is justified pursuant to subregulation (1), the Minister shall consult-

(a) the competent authority;

(b) where the class or type of practice involves work with any radioactive substance, the Environmental Agency; and

(c) any other person or body which the Minister considers appropriate.

(7) Where, having consulted others pursuant to subregulation (6), the Minister is of the opinion that a new class or type of practice may not be justified, he shall afford the person seeking the determination an opportunity to make representations to him before making any determination pursuant to subregulation (1).

(8) Prior to determining whether an existing class or type of practice is justified pursuant to subregulation (3), the Minister shall consult-

(a) the competent authority;

(b) where the class or type of practice involves work with any radioactive substance, the Environmental Agency; and

(c) any other person or body which the Minister considers appropriate.

(9) Where, having consulted others pursuant to subregulation (8), the Minister is of the opinion that an existing class or type of practice is not justified and ought to be prohibited he shall-

(a) take such steps as it considers appropriate to bring the proposed prohibition to the attention of any person who is carrying on a practice of such class or type and who may be directly affected by that prohibition; and

(b) afford, so far as is reasonably practicable, such person an opportunity to make representations to him,

before imposing any prohibition pursuant to subregulation (3).

(10) In this regulation, "new class or type of practice" means a class or type of practice which is carried out for the first time after the coming into force of these Regulations.

(11) Notwithstanding the provisions of subregulations (1) and (3), the deliberate addition of any radioactive substance in the production of any of the following shall be prohibited-

(a) any toy;

(b) any personal ornament; and

(c) any cosmetic.

(12) Proceedings for an offence under this regulation shall not be instituted without the consent of the Attorney General.

(13) Nothing in subregulation (1) or (3) shall prevent, in relation to a medical exposure, the administering of a specific individual exposure to ionising radiation permitted by Article 3.1(b) of Council Directive 97/43/Euratom.

(14) This Regulation does not apply to activities on board, or related to, nuclear powered warships.

(15) Where the Secretary of State determines that, for overriding reasons of national security, it is necessary for any function under this regulation to be exercised by the Secretary of State, any reference to the Minister in this Regulation shall be construed as a reference to the Secretary of State.

6.(1) Subject to subregulation (2), a radiation employer shall not carry out any of the following practices-

(a) the use of electrical equipment intended to produce x-rays or radioactive sources for the purpose of-

(i) industrial radiography,

(ii) the processing of products,

(iii) research; or

(iv) the exposure of persons for medical treatment;

(b) the use of accelerators other than electron microscopes;

(c) the deliberate addition of radioactive substances in the production and manufacture of consumer goods;

(d) the operation (except aboard a visiting nuclear powered warship) and decommissioning of any facility of the nuclear fuel cycle;

(e) the keeping, use, accumulation or disposal of a high activity source,

except in accordance with a prior written authorisation granted by the competent authority for the purposes of this subregulation.

(2) Subregulation (1) shall not apply in respect of any practice of a type which is for the time being authorised by the competent authority, where such practice is being or is to be carried out in accordance with such conditions as may be approved by the authority from time to time in respect of that type of practice.

(3) No employer shall carry out any activity involving the disposal, recycling or reuse of radioactive substances or materials containing radioactive substances arising from any practice referred to in subregulation (1) except in accordance with a prior written authorisation granted by the competent authority for the purposes of this subregulation.

(4) An authorisation granted for the purposes of subregulation (1) or subregulation (3) may be granted subject to conditions and with or without limit of time and may be revoked in writing at any time.

(5) Where an employer subsequently makes any change to a practice or activity in respect of which an authorisation has been granted for the purposes of subregulation (1) or subregulation (3), such that the particulars relating to that authorisation are no longer accurate, he shall notify the competent authority forthwith of that change.

(6) An employer who is aggrieved by-

(a) a refusal to grant an authorisation for the purposes of subregulation (1) or subregulation (3);

(b) any of the conditions attached to any such authorisation;

(c) any limit of time imposed upon any such authorisation; or

(d) the revocation of any such authorisation,

may appeal to the Minister.

(7) The Minister may, in such cases as he considers it appropriate to do so, having regard to the nature of the questions which appear to him to arise, direct that an appeal under this regulation shall be determined on his behalf by a person appointed by him for that purpose.

(8) Before the determination of an appeal the Minister shall ask the appellant and the competent authority whether they wish to appear and be heard on the appeal and-

(a) the appeal may be determined without a hearing of the parties if both of them express a wish not to be heard as aforesaid;

(b) the Minister shall, if either of the parties expresses a wish to appear and be heard, afford both to both of them an opportunity of so doing.

(9) The person who determines an appeal under this regulation (whether it be the Minister himself or another person appointed by him to do so on his behalf) may give such directions as he considers appropriate to give effect to his determination.

(10) The Minister may pay to any person appointed to hear or determine an appeal under this regulation on his behalf such remuneration and allowances as the Minister may determine.

Notification of specified work.

7.(1) This regulation shall apply to work with ionising radiation other than that specified in Schedule 1.

(2) Subject to subregulations (7) and (8) and regulation 52(1) (which relates to transitional provisions), any radiation employer who intends for the first time to carry out work to which this regulation applies shall notify the competent authority at least 28 days (or such shorter time as the authority may agree) before he commences that work, which notification shall be in accordance with Schedule 2.

(3) Upon receipt of a notification pursuant to subregulation (2), the competent authority may, by notice in writing, require the radiation employer to provide it with any or all of the additional particulars specified in Schedule 3 by such time as may be specified in the notice or by such other time as the authority may subsequently agree.

(4) A notice under subregulation (3) may require the radiation employer to notify the competent authority of any of the particulars specified therein before each occasion on which he commences work with ionising radiation.

(5) Where a radiation employer subsequently makes any change to the work in respect of which he has submitted a notification pursuant to subregulation (2), such that the particulars provided therein are no longer accurate, he shall notify the competent authority forthwith of that change.

(6) Nothing in subregulation (5) shall be taken as requiring a cessation of the work which has been changed except where the change to the work involves vacating the site or any part of the site where the work was being carried out.

(7) Where the only work with ionising radiation being carried out is of a kind which is referred to in regulation 3(1)(b) or (c), it shall be sufficient compliance with subregulation (2) if the radiation employer having control of the premises where the work is being carried out submits the notice required by that subregulation forthwith after that work has commenced.

(8) Where the work with ionising radiation involves the care of a person to whom a medicinal product (within the meaning of the Ionising Radiation (Administration of Medicinal Products and Medicinal Exposures) Regulations 1995) has been administered, it shall be sufficient compliance with subregulation (2) if the notification required by that subregulation is submitted as soon as is practicable before such work is carried out.

(9) Where in respect of work with ionising radiation being carried out prior to the coming into force of these Regulations notification has been given to the Government pursuant to any statutory requirement, the

provisions of this regulation shall apply to such notification as if that notification had been given in accordance with subregulation (2).

Prior risk assessment etc.

8.(1) No radiation employer shall commence any new activity involving work with ionising radiation unless he has made a suitable and sufficient assessment of the risk to any employee and any other person of exposure to ionising radiation, for the purpose of identifying the measures he needs to take to restrict such exposure.

(2) A risk assessment made by a radiation employer pursuant to subregulation (1) shall include-

(a) identification of all hazards with the potential to cause a radiation accident; and

(b) evaluation of the nature and magnitude of the risk to employees and other persons arising from any such hazards.

(3) Where a risk assessment made pursuant to subregulation (1) reveals a risk to any employee or other person of exposure to ionising radiation from an identifiable radiation accident, the radiation employer shall take all reasonably practicable steps to-

(a) prevent the occurrence of any such accident;

(b) limit the consequences of any such accident which does occur; and

(c) provide employees who may be affected by any such accident with the necessary information, instruction, training and equipment to restrict their exposure to ionising radiation.

(4) The requirements of this regulation are without prejudice to the requirements of regulation 7 (Risk assessment) of the Management of Health and Safety at Work Regulations 1996.

Restriction of exposure.

9.(1) Every radiation employer shall take all necessary steps, in relation to any work with ionising radiation carried out by him, to restrict, so far as is reasonably practicable, the exposure of his employees and other persons to such radiation.

(2) Without prejudice to the generality of subregulation (1), the radiation employer shall ensure that, in so far as it is reasonably practicable, the

exposure of his employees and other persons to ionising radiation is restricted-

(a) by means of engineering controls and design features and by the provision of safety features and warning devices;

(b) by the provision of suitable systems of work; and

(c) by the provision of adequate and suitable personal protective equipment, including respiratory protective equipment.

(3) A radiation employer shall take all reasonable steps to ensure that whatever is provided pursuant to subregulation (2) is properly used or applied, as the case may be.

(4) Where appropriate, the radiation employer shall use dose constraints at the planning stage of radiation protection in order to restrict exposure to ionising radiation, pursuant to subregulation (1).

(5) Without prejudice to the generality of subregulation (1) and subject to subregulation (6), a radiation employer shall ensure that-

(a) in relation to an employee who is pregnant, her exposure to ionising radiation is restricted such that the equivalent dose to the foetus will be as low as reasonably achievable and that it will be unlikely to exceed 1 mSv during the remaining period of her pregnancy; and

(b) in relation to an employee who is breastfeeding, she is not employed in work involving a significant risk of bodily radioactive contamination.

(6) Nothing in subregulation (5) shall require the radiation employer to take any action in relation to any employee who is pregnant or breastfeeding unless-

(a) she has notified her employer in writing of her condition; and

(b) the radiation employer (where he is not her employer) has been made aware or should otherwise have reasonably been expected to be aware of her condition.

(7) For the purpose of determining whether the requirements of subregulation (1) are being met, every radiation employer shall ensure that an investigation is carried out forthwith when the effective dose of ionising radiation received by any of his employees for the first time in any calendar year exceeds 15 mSv or such other lower effective dose as the employer

may have specified in writing in local rules, pursuant to regulation 19(1) or, where local rules are not required, by other suitable means.

Personal protective equipment.

10.(1) Any item of personal protective equipment provided by a radiation employer pursuant to regulation 9 shall comply with any provision in the Factories (Provision and Use of Work Equipment) Regulations 1999 which is applicable to that item.

(2) Where in the case of respiratory protective equipment no provision of the Regulations referred to in subregulation (1) applies, that respiratory protective equipment shall not be suitable for the purposes of regulation 9 unless it is of a type or conforms to a standard, approved in either case by the competent authority.

(3) Every radiation employer shall-

(a) ensure that appropriate accommodation is provided for the storage of any personal protective equipment provided pursuant to regulation 9; and

(b) take all reasonable steps to ensure that such equipment is placed therein, when it is not being worn.

Maintenance and examination of engineering controls etc. and personal protective equipment.

11. Every radiation employer shall ensure that any engineering controls, design features, safety features, warning devices and personal protective equipment provided pursuant to regulation 9-

(a) are properly maintained;

(b) where appropriate, are examined thoroughly and tested at suitable intervals; and

(c) in the case of respiratory protective equipment, a suitable record of any such examination is-

(i) made (which record shall include a statement of the condition of the equipment at the time of the examination); and

(ii) kept for at least two years from the date of the said examination.

Dose limitation.

12.(1) Subject to subregulation (2), every employer shall ensure that the dose limits specified in Part I of Schedule 4 in relation to each of the classes of persons mentioned therein are not exceeded.

(2) Paragraph 1 of Part I of Schedule 4 shall not apply in relation to any employee who is 18 years of age or over where a radiation employer is able to demonstrate that, having regard to the nature of the work undertaken by that employee, it is not practicable to apply the dose limit specified therein, in which case the provisions of Part II of the said Schedule shall apply.

Contingency plans.

13.(1) Where a risk assessment made pursuant to regulation 8 shows that a radiation accident is reasonably foreseeable (taking into account the steps taken pursuant to subregulation (3) of that regulation), the radiation employer shall prepare a contingency plan designed to ensure the health and safety of his employees and other persons who may be affected by such an accident and, in particular, to restrict the exposure of such persons to ionising radiation, so far as is reasonably practicable.

(2) Where a radiation employer prepares a contingency plan pursuant to subregulation (1) he shall ensure that-

(a) those of his employees who may be concerned with or affected by arrangements in the plan are-

(i) provided with such information and instruction as is suitable and sufficient for them to know what they must do in the event of a radiation accident; and

(ii) issued, where appropriate, with suitable dosemeters or other devices obtained in either case from the approved dosimetry service with which the radiation employer has entered into an arrangement pursuant to regulation 23; and

(b) where appropriate, rehearsals of the arrangements in the plan are carried out at suitable intervals.

(3) The radiation employer shall ensure that a copy of any contingency plan prepared pursuant to subregulation (1) is incorporated into any local rules made pursuant to regulation 19(1), by way of summary or reference.

ARRANGEMENTS FOR THE MANAGEMENT OF RADIATION PROTECTION

Radiation protection advisers.

14.(1) Subject to subregulation (3), every radiation employer shall consult such suitable radiation protection advisers as are necessary for the purpose of advising him on the application of these Regulations ensuring that any work with ionising radiation is carried out in accordance with these Regulations, which consultation shall include the matters specified in Schedule 5.

(2) Where a radiation employer consults a radiation protection adviser pursuant to subregulation (1) with regard to any matters other than those specified in Schedule 5, the employer shall appoint that adviser in writing and specify in that appointment the scope of the advice which the adviser is required to give.

(3) Nothing in subregulation (1) shall require a radiation employer to consult a radiation protection adviser where the only work with ionising radiation carried out by him is work specified in Schedule 1.

(4) The radiation employer shall provide any radiation protection adviser appointed by him with adequate information and facilities for the performance of his functions.

Information, instruction and training.

15. Every radiation employer shall ensure that-

(a) those of his employees who are engaged in work with ionising radiation are given suitable and sufficient information, instruction and training in the field of radiation protection (having regard to the specific work to be carried out) for the purpose of ensuring that they know-

(i) the risks to health created by exposure to ionising radiation;

(ii) the precautions to be taken;

(iii) the importance of complying with the administrative, medical and technical requirements of these Regulations;

(b) any of his female employees who is engaged in work with ionising radiation is informed-

(i) of the risks to the health of any foetus or nursing infant created by her exposure to ionising radiation; and

(ii) of the importance of notifying him in writing as soon as she discovers she is pregnant or starts breastfeeding; and

(c) adequate information is given to any other person who is directly concerned with the work with ionising radiation carried out by the radiation employer, for the purpose of ensuring, so far as is reasonably practicable, that person's health and safety.

Co-operation between employers.

16. Where work with ionising radiation carried out by a radiation employer is likely to give rise to the exposure to ionising radiation of any employee of another employer, the employers concerned shall co-operate with each other (by the exchange of information or otherwise) to the extent necessary to ensure that each such employer is able to comply with the requirements of these Regulations in so far as his ability to comply depends upon such co-operation.

PART IV

DESIGNATED AREAS

Designation of controlled area.

17.(1) Where, pursuant to regulation 8 or otherwise, a radiation employer makes a risk assessment which shows that, in relation to an area under his control-

(a) there is a risk that persons entering the area will receive significant exposure to ionising radiation or there is a significant risk of the spread of radioactive contamination outside the area, such that it is necessary to require those persons who enter or work in the area to follow special procedures designed to restrict such exposure and to limit such spread; or

(b) any person working in that area is likely to receive an effective dose of ionising radiation greater than 6 mSv per year or an equivalent dose greater than three-tenths of any relevant dose limit referred to in Schedule 4 in respect of an employee of 18 years of age or above,

the employer shall designate that area as a controlled area.

(2) No employer shall intentionally create in any area conditions which would require that area to be designated as a controlled area unless that area is for the time being under his control.

Designation of supervised areas.

18. Where, pursuant to regulation 8 or otherwise, a radiation employer makes a risk assessment which shows that, in relation to any area under his control, other than a controlled area-

(a) the working conditions are such that they must be kept under review because it may become necessary to designate the area as a controlled area; or

(b) any person entering that area is likely to receive an effective dose of ionising radiation greater than 1 mSv per year or an equivalent dose greater than one-tenth of any relevant dose limit referred to in Schedule 4 in respect of an employee of 18 years of age or above,

the employer shall designate that area as a supervised area.

Local rules and radiation protection supervisors.

19.(1) Every radiation employer shall make and set down in writing such local rules as are appropriate to the radiation risk associated with the radiation sources and the operations involved in the work with ionising radiation-

(a) in any controlled area; and

(b) where appropriate, having regard to the nature of the work, in any supervised area.

(2) The radiation employer shall take all reasonable steps to ensure that any local rules made pursuant to subregulation (1) are observed.

(3) The radiation employer shall ensure that such of those rules made pursuant to subregulation (1) as are relevant are brought to the attention of those employees and other persons who may be affected by them.

(4) The radiation employer shall-

(a) appoint one or more suitable radiation protection supervisors for the purpose of ensuring compliance with these Regulations in respect of work carried out in any designated area made subject to local rules, pursuant to subregulation (1), and, in particular, for the purpose of ensuring such local rules are observed; and

(b) ensure that such supervisors receive the appropriate training to enable them to fulfil their role.

(5) The radiation employer shall ensure that-

(a) any area designated as a controlled area pursuant to regulation 17 or as a supervised area pursuant to regulation 18 is adequately described; and

(b) the names of any radiation protection supervisors appointed pursuant to subregulation (2) are set down,

in any local rules made pursuant to subregulation (1).

Additional requirements for designated areas.

20.(1) Where a radiation employer designates any area as a controlled area he shall ensure-

(a) that the area is physically demarcated or, where this is not reasonably practicable, delineated by some other suitable means; and

(b) that suitable and sufficient signs are displayed in suitable positions indicating-

(i) that the area is a controlled area;

(ii) the nature of the radiation sources therein; and

(iii) the risks arising from such sources.

(2) No employer shall permit any employee or other person to enter or remain in a controlled area unless that employee or other person, as the case may be-

(a) is a person designated by the employer as a classified person;

(b) is an outside worker in respect of whom the employer has taken all reasonable steps to ensure that-

(i) he is subject to individual dose assessment, pursuant to regulation 23;

(ii) he has been provided with adequate and suitable personal protective equipment, where necessary, pursuant to regulation 9(2)(c) and has been trained to use it;

(iii) he has been given suitable and sufficient information, instruction and training, pursuant to regulation 15; and

(iv) an appointed doctor has determined, pursuant to regulation 26, that he is fit for the work with ionising radiation which he is to carry out; or

(c) not being a person who falls into either paragraph (a) or (b), is subject to suitable written arrangements drawn up for the purpose of ensuring that whilst he is in the controlled area-

(i) in the case of an employee of 18 years of age or above, he does not receive in any calendar year a cumulative dose of ionising radiation which would require him to be designated as a classified person pursuant to regulation 22; or

(ii) in the case of any other person, he does not receive in any calendar year a dose of ionising radiation which exceeds any relevant dose limit specified in Schedule 4,

and the employer can demonstrate, by personal dose monitoring or other suitable measurement, that the doses are restricted accordingly.

(3) Where an employer monitors or measures the exposure of any employee or other person pursuant to subregulation (2)(c), he shall-

(a) keep the results for a period of two years from the date they were recorded; and

(b) make them available to that person at his request and upon reasonable notice being given.

(4) Where any outside worker is required to work in any area designated by a radiation employer as a controlled area, that employer shall ensure that-

(a) the outside worker is subject to arrangements for estimating the dose of ionising radiation he receives whilst in the controlled area;

(b) as soon as is reasonably practicable after the work carried out by the outside worker in the controlled area is completed, an estimate of the dose of ionising radiation received by him is entered into his radiation passbook; and

(c) whilst the radiation passbook is in the possession of the radiation employer, it is made available to the outside worker, upon request.

(5) Where there is a significant risk of the spread of radioactive contamination from any area which has been designated by a radiation employer as a controlled area, that employer shall make adequate arrangements to restrict, so far as is reasonably practicable, any such spread.

(6) Without prejudice to the generality of subregulation (5), the arrangements required by that subregulation shall include, where appropriate-

(a) the provision and maintenance of suitable and sufficient washing and changing facilities for persons who enter or leave any controlled area;

(b) the prohibition of eating, drinking, smoking and any other similar activity which is likely to result in the ingestion of a radioactive substance in any controlled area; and

(c) monitoring for the radioactive contamination of any person, article or goods leaving any controlled area.

(7) Where appropriate, a radiation employer who designates any area as a supervised area shall ensure-

(a) that suitable and sufficient signs are displayed in suitable positions indicating-

(i) that the area is a supervised area;

(ii) the nature of the radiation sources therein; and

(iii) the risks arising from such sources; and

(b) the provision and maintenance of suitable and sufficient washing and changing facilities for persons who enter or leave any such area.

Monitoring of designated areas.

21.(1) Every radiation employer who designates any area as a controlled area or as a supervised area shall take such steps as are necessary (otherwise than by use of assessed doses of individuals), having regard to the nature and extent of the risks arising from exposure to ionising radiation, to ensure that levels of ionising radiation are adequately monitored and that working conditions are kept under review in any such area.

(2) The radiation employer shall provide suitable and sufficient equipment for carrying out the monitoring required by subregulation (1), which equipment shall be-

(a) maintained so that it remains fit for the purpose for which it was intended;

(b) tested by or under the immediate supervision of a qualified person before it is used for the first time in order to establish its performance; and

(c) subsequently examined and tested by or under the immediate supervision of a qualified person at appropriate intervals.

(3) The radiation employer shall-

(a) make suitable records of the results of any monitoring carried out pursuant to subregulation (1) and of any test or examination carried out pursuant to subregulation (2);

(b) ensure that the records of the tests carried out pursuant to subregulation (2)(b) are authenticated by the qualified person under whose direction the tests were carried out; and

(c) keep the records referred to in paragraph (a), or copies thereof, for at least two years from the respective dates on which they were made.

PART V

CLASSIFICATION AND MONITORING OF PERSONS

Designation of classified persons.

22.(1) Subject to subregulation (2), the employer shall designate as a classified person any of his employees who is likely to receive an effective dose of ionising radiation in excess of 6 mSv per year or an equivalent dose in excess of three-tenths of any relevant dose limit and shall inform any such employee that he has been so designated.

(2) The employer shall not designate an employee as a classified person unless-

(a) that employee is aged 18 years or above; and

(b) an appointed doctor has certified in the health record relating to that employee that he is fit for the work with ionising radiation which he is to carry out.

(3) Where an employer designates an employee as a classified person pursuant to subregulation (1) he may only cease to treat him as such at the end of a calendar year unless, in the interim-

(a) an appointed doctor requires otherwise; or

(b) the employee ceases to be employed by the employer in a capacity which is likely to result in his receiving an effective dose of ionising radiation in excess of 1 mSv during the remainder of the relevant calendar year.

Dose assessment and recording.

23.(1) Where an employer designates any employee as a classified person he shall make arrangements with one or more approved dosimetry services for-

(a) the systematic assessment of any dose of ionising radiation received by that employee which is likely to be significant; and

(b) the making and maintenance of a record of all such assessments, hereinafter referred to as a “dose record”.

(2) The systematic assessment referred to in subregulation (1)(a) shall be based upon a suitable form of individual measurement established by the approved dosimetry service, except where such measurement would be impossible or inadequate, in which case it shall be based upon another suitable form of measurement.

(3) The dose record referred to in subregulation (1)(b), or a copy thereof, shall be kept until the person to whom it relates has attained or would have attained the age of 75 years but in any event for a period of at least 50 years from the date it was made.

(4) In addition to the arrangements made pursuant to subregulation (1), the employer shall make arrangements with one or more approved dosimetry services-

(a) at appropriate intervals, to provide the employer with a suitable summary of the dose record relating to each classified person employed by him;

(b) when required by the employer, to provide him with a copy of the dose record relating to a particular employee;

(c) when required by the employer, to-

(i) make a record of the information concerning the dose assessments relating to a classified person who ceases to be an employee of the employer; and

(ii) send that record (hereinafter referred to as a "termination record",) to the competent authority; and a copy thereof to the employer forthwith;

(d) within three months of the end of each calendar year, or such longer period as the competent authority may agree, to send to the authority summaries of all dose records relating to that year;

(e) when required by the competent authority, to send a copy of the dose record relating to any particular employee to the authority;

(f) where the dose of ionising radiation received by any classified person during any period of time is estimated pursuant to regulation 24, to-

(i) make an entry in the dose record relating to that person; and

(ii) keep a summary of the information used to estimate that dose;

(g) where the employer employs an outside worker, to provide, where appropriate, a radiation passbook in respect of that worker; and

(h) where the employer employs an outside worker who works in Great Britain, Northern Ireland or in another member State, to

maintain a continuing record of the assessment of doses received by him whilst working in that place.

(5) The employer shall provide the approved dosimetry services appointed by him with such information concerning his employees as is necessary to enable those services to comply with the arrangements made with the employer, pursuant to subregulations (1) and (4).

(6) Where an employer employs an outside worker he shall-

(a) ensure that he is provided with a radiation passbook which shall not be transferable to any other worker and in which shall be entered the particulars set out in Schedule 6; and

(b) make suitable arrangements to ensure that the particulars entered in his radiation passbook pursuant to paragraph (a) are kept up-to-date throughout his period of employment with him.

(7) At the request of, and upon reasonable notice being given by, a classified person employed by him or formerly employed by him in that capacity, the radiation employer shall ensure that such person is provided with-

(a) a copy of the summary of the dose record relating to him for the two year period preceding the request; and

(b) a copy of the dose record relating to that person.

(8) When a classified person ceases to be employed by an employer, that employer shall take all reasonable steps to ensure that such person is provided with a copy of the termination record relating to him.

(9) The employer shall keep a copy of the summary of the dose record relating to each classified person for a period of at least two years from the end of the calendar year to which the summary relates.

Estimated doses and special entries.

24.(1) Where a dosemeter or other device is used to make any individual measurement of the dose of ionising radiation received by any classified person, pursuant to regulation 23(2) and that dosemeter or device is lost, damaged or destroyed or, for any other reason, it is not practicable to assess the dose received by that person over any period, the employer shall-

(a) investigate the circumstances of the case with a view to estimating the dose received by that person during that period;

(b) (i) in a case where there is adequate information to estimate the dose received by that person-

(aa) send a summary of that information to the relevant approved dosimetry service; and

(bb) arrange for that service to enter the estimated dose and identify it as such in the dose record of that person; or

(ii) in a case where there is inadequate information to estimate the dose received by that person, arrange for the relevant approved dosimetry service to enter a notional dose and identify it as such in the dose record of that person, which dose shall be the proportion of the total annual dose limit for the relevant period; and

(c) in either case referred to in paragraph (b), take all reasonable steps to inform the classified person of the entry.

(2) At the request of, and upon reasonable notice being given by, any employee designated as a classified person or any former employee who was designated as a classified person whilst employed by the employer, in respect of whom an investigation was carried out pursuant to subregulation (1), the employer shall make available to that person (or in the case of a former employee provide that person with) a copy of the summary of information sent to the approved dosimetry service pursuant to subregulation (1)(a).

(3) Subject to subregulations (5) and (8), where an employer has reasonable cause to believe that the dose of ionising radiation received by a classified person is much greater or much less than the relevant recorded dose entered in the dose record of that person, he shall carry out an adequate investigation of the circumstances of the exposure of that person to ionising radiation and, if that investigation confirms his belief and there is adequate information to estimate the dose received by that person, he shall-

(a) estimate the said dose;

(b) send a summary of the information used to estimate the dose to the relevant approved dosimetry service;

(c) arrange for the approved dosimetry service to substitute the estimated dose for the relevant recorded dose entered in the dose record of that person and identify the estimated dose as a special entry; and

(d) notify the classified person accordingly.

(4) The employer shall-

(a) make a report of any investigation carried out under subregulation (3); and

(b) keep a copy of that report for a period of 2 years from the date it was completed.

(5) Subregulation (3) shall not apply-

(a) in respect of a classified person who is subject only to an annual dose limit, more than 12 months after the original entry was made in the dose record; and

(b) in any other case, more than 5 years after the original entry was made in the dose record.

(6) Where a classified person is aggrieved by a decision to substitute an estimated dose for a recorded dose pursuant to subregulation (3), he may apply in writing to the competent authority within 3 months of the date on which he was notified of the decision, for that decision to be reviewed.

(7) Where the competent authority concludes, in relation to any estimated dose recorded in the dose record of any classified person as a special entry, (whether as a result of a review carried out pursuant to subregulation (6) or otherwise) that-

(a) there is reasonable cause to believe an investigation carried out pursuant to subregulation (3) was not adequate; or

(b) it has not been established that the estimated dose recorded in the dose record is a reasonable estimate of the dose actually received,

the authority may direct the employer to re-instate the original entry in the dose record.

(8) The employer shall not arrange for the relevant approved dosimetry service to enter an estimated dose in the dose record of any classified person, pursuant to subregulation (3)(c), where-

(a) the cumulative recorded effective dose is 20 mSv or more in any relevant calendar year; or

(b) the cumulative recorded equivalent dose for the relevant calendar year exceeds a relevant dose limit,

unless he has obtained the prior consent of the competent authority.

Dosimetry for accidents etc.

25.(1) Where any accident or other incident occurs which is likely to result in any person receiving an effective dose of ionising radiation exceeding 6 mSv or an equivalent dose greater than three-tenths of any relevant dose limit, the employer shall-

(a) in the case of a classified person, arrange forthwith for a dose assessment to be made by the approved dosimetry service;

(b) in the case of an employee to whom a dosemeter or other device has been issued pursuant to regulation 13(2)(b),arrange for that dosemeter or other device to be examined and for the dose of ionising radiation received to be assessed by the approved dosimetry service as soon as possible;

(c) in any other case, arrange for the dose to be assessed by an appropriate means as soon as possible, having regard to the advice of the radiation protection adviser.

(2) Where a dose assessment is made pursuant to subregulation (1) the employer shall-

(a) take all reasonably practicable steps to inform each person for whom such an assessment has been made of the result of that assessment; and

(b) keep a record of any such assessment or a copy thereof until the person to whom the record relates has or would have attained the age of 75 years but in any event for a period of at least 50 years from the date of the relevant accident or incident.

Medical surveillance.

26.(1) This regulation shall apply in relation to-

(a) any employee who has been designated as a classified person and any person whom an employer intends to designate as a classified person;

(b) any employee, not being a classified person, who has received an overexposure of ionising radiation; and

(c) any employee whose work with ionising radiation is subject to conditions specified in his health record by an appointed doctor under subregulation (6).

(2) The employer shall ensure that each of his employees to whom this regulation relates is under adequate medical surveillance by an appointed doctor for the purpose of determining the fitness or continuing fitness of each such employee for the work with ionising radiation which he is to carry out.

(3) The employer shall ensure that a health record, containing the particulars referred to in Schedule 7, is-

(a) made and maintained in respect of each of his employees to whom this regulation relates; and

(b) kept (or a copy thereof is kept) until the person to whom it relates has or would have attained the age of 75 years but in any event for a period of at least 50 years from the date of the last entry made in it.

(4) The employer shall ensure that there is a valid entry, made by the appointed doctor, in the health record of each employee (other than any employee, not being a classified person, who has received an overexposure of ionising radiation) indicating that person's fitness for the work with ionising radiation which he is to carry out.

(5) For the purposes of subregulation (4), an entry in an employee's health record shall be valid-

(a) for a period of 12 months from the date it was made or treated as made by virtue of subregulation (6); or

(b) for such shorter period as may be specified in the entry by the appointed doctor,

unless cancelled before the expiry of such period by a further entry.

(6) For the purposes of subregulation (5)(a), a further entry in an employee's health record made not less than 11 months nor more than 13 months after the start of the current period of validity shall be treated as if made at the end of the 12 month period.

(7) Where an appointed doctor has certified in an employee's health record that, in his opinion, the employee should-

(a) not be engaged in work with ionising radiation; or

(b) only be engaged in work with ionising radiation under the conditions specified by him in the record,

the employer shall not permit the employee to be so engaged or shall only permit him to be so engaged in accordance with the specified conditions, whichever is the case.

(8) For the purpose of enabling him to carry out adequate medical surveillance of each employee to whom this regulation relates, the employer shall-

(a) upon request, permit the appointed doctor to inspect any workplace; and

(b) make available to the appointed doctor-

(i) the summary of any dose record relating to that employee; and

(ii) such other records relating to that employee as the appointed doctor may reasonably require to see.

(9) Where an employee is aggrieved by any entry made by an appointed doctor in his health record he may apply to the competent authority within 3 months of being notified of the said entry, for that entry to be reviewed in accordance with a procedure approved for the purposes of this subregulation by the authority and the result of that review shall be notified to the employee and entered in his health record in accordance with the approved procedure.

Investigation and notification of overexposure.

27.(1) Where a radiation employer suspects or has been informed that any person is likely to have received an overexposure as a result of work carried out by that employer, that employer shall make an immediate investigation to determine whether such an overexposure has occurred.

(2) Unless the results of the investigation made pursuant to subregulation (1) show beyond reasonable doubt that no overexposure could have occurred, the radiation employer shall-

(a) notify the suspected overexposure, as soon as is practicable-

(i) to the competent authority;

(ii) in the case of an employee of some other employer, to that employer; and

(iii) in the case of his own employee, to the appointed doctor; and

(b) take all reasonable steps to notify the suspected overexposure to the person affected, as soon as is practicable.

(3) Having complied with subregulations (1) and (2), thereafter the radiation employer shall-

(a) make or arrange for a detailed investigation to be carried out to determine-

(i) the dose of ionising radiation received by the individual; and

(ii) if there was an overexposure, why it occurred and what reasonably practicable measures, if any, are required to be taken in order to prevent a recurrence thereof;

(b) notify the results of that investigation to the persons and authorities referred to in subregulation (2)(a), forthwith; and

(c) (i) in the case of his own employee, notify him of the results of the investigation, including the assessment of the dose of ionising radiation received by him, forthwith; or

(ii) in the case of any other person, where the investigation has shown that that person received an overexposure, take all reasonable steps to notify him of his overexposure.

(4) Where an investigation is made pursuant to subregulation (1) or (3), the radiation employer shall-

(a) make a report of that investigation; and

(b) (i) in the case of an immediate investigation made pursuant to subregulation (1), keep that report or a copy thereof for a period of at least two years from the date on which it was completed; and

(ii) in the case of a detailed investigation made pursuant to subregulation (3), keep that report or a copy thereof until the person to whom it relates has or would have attained the age of

75 years but in any event for a period of at least 50 years from the date on which it was completed.

(5) Where the person who received the overexposure is an employee who has a dose record, his employer shall arrange for the assessment of the dose received to be entered into that dose record.

Dose limitation for overexposed employees.

28.(1) Without prejudice to other requirements of these Regulations and, in particular, to the requirements of regulation 26(7), where an employee has been subjected to an overexposure, subregulation (2) shall apply in relation to the employment of that employee on work with ionising radiation during the remainder of the dose limitation period, commencing at the end of the personal dose assessment period in which he was subjected to the overexposure.

(2) The employer shall ensure that any employee who has been subjected to an overexposure does not receive, during the remainder of the dose limitation period, a dose of ionising radiation greater than that proportion of any dose limit which is equal to the proportion that the remaining part of the dose limitation period bears to the whole of that period.

(3) The employer shall inform an employee who has been subjected to an overexposure of the dose limit which is applicable to that employee for the remainder of the relevant dose limitation period.

(4) In this regulation, "dose limitation period" means, as appropriate, a calendar year or the period of five consecutive calendar years.

PART VI

ARRANGEMENTS FOR THE CONTROL OF RADIOACTIVE SUBSTANCES, ARTICLES AND EQUIPMENT

Sealed sources and articles containing or embodying radioactive substances.

29.(1) Where a radioactive substance is used as a source of ionising radiation in work with ionising radiation, the radiation employer shall ensure that whenever reasonably practicable, the substance is in the form of a sealed source.

(2) The radiation employer shall ensure that the design, construction and maintenance of any article containing or embodying a radioactive substance, including its bonding, immediate container or other mechanical protection, is such as to prevent the leakage of any radioactive substance-

(a) in the case of a sealed source, so far as is practicable; or
(b) in the case of any other article, so far as is reasonably practicable.

(3) The radiation employer shall-

(a) ensure, where appropriate, that suitable tests are carried out at suitable intervals to detect any leakage of radioactive substances from any article to which subregulation (2) applies;

(b) make a suitable record of each such test; and

(c) keep such record for a period of at least 2 years after the article is disposed of or until a further record is made following a subsequent test on that article.

Accounting for radioactive substances.

30. For the purpose of controlling any radioactive substance which is involved in work with ionising radiation which he undertakes, every radiation employer shall-

(a) take such steps as are appropriate to account for the quantity and location of that substance;

(b) make a suitable record thereof; and

(c) keep such record or a copy thereof for a period of at least 2 years from the date on which it was made and in any event for a period of at least 2 years from the date of disposal of that radioactive substance.

Keeping and moving of radioactive substances.

31.(1) Every radiation employer shall ensure, so far as is reasonably practicable, that any radioactive substance under his control, which is not, for the time being, in use or being moved, transported or disposed of, is kept-

(a) in a suitable receptacle; and

(b) in a suitable store.

(2) Every employer who causes or permits a radioactive substance to be moved (otherwise than by transporting it) shall ensure that, so far as is reasonably practicable, the substance-

(a) is kept in a suitable receptacle; and

(b) is suitably labelled,

while it is being moved.

(3) Nothing in subregulations (1) or (2) shall apply in relation to a radioactive substance while it is in or on the live body or corpse of a human being.

Notification of certain incidents.

32.(1) Every radiation employer shall notify the competent authority forthwith in any case where a quantity of a radioactive substance, which exceeds the quantity specified for that substance in column 4 of Schedule 8 and which was under his control, has been-

(a) released or is likely to have been released into the atmosphere as a gas, aerosol or dust; or

(b) spilled or otherwise released in such a manner as to give rise to significant contamination.

(2) Every radiation employer shall notify the competent authority forthwith in any case where he has reasonable cause to believe that a quantity of a radioactive substance, which exceeds the quantity specified for that substance in column 5 of Schedule 8 and which was under his control, has been lost or stolen.

(3) Where a radiation employer suspects or has been informed that an incident notifiable under subregulation (1) or (2) may have occurred, he shall make an immediate investigation and, unless that investigation shows that no such incident has occurred, he shall notify the competent authority forthwith, in accordance with the relevant subregulation.

(4) A radiation employer who makes an investigation pursuant to subregulation (3) shall-

(a) make a report of that investigation; and

(b) keep that report or a copy thereof for a period of at least 50 years, unless the investigation shows that no incident notifiable under subregulation (1) or (2) occurred, in which case, he shall keep that report for a period of at least 2 years from the date on which it was made.

Duties of installers etc. of articles for use in work with ionising radiation.

33. Where a person erects or installs an article for use in work with ionising radiation, he shall-

(a) undertake, where appropriate, a critical examination of the way in which the article was erected or installed, for the purpose of ensuring in particular that-

(i) the safety features and warning devices operate correctly; and

(ii) there is sufficient protection for persons from exposure to ionising radiation;

(b) consult with the radiation protection adviser, appointed by himself or by the radiation employer, regarding the nature and extent of any critical examination and the results thereof; and

(c) provide the radiation employer with adequate information about proper use, testing and maintenance of the article.

Equipment used for medical exposure.

34.(1) Every employer who has control, to any extent, of any equipment which is used in connection with a medical exposure shall ensure, having regard to the extent of his control, that-

(a) the design, construction, installation and maintenance of the equipment is such that it is capable of restricting, so far as is reasonably practicable, the exposure to ionising radiation of any person who is undergoing a medical exposure, to the extent that such restriction is compatible with the intended clinical purpose or research objective; and

(b) a suitable quality assurance programme is put in place for the purpose of ensuring that the equipment remains so capable.

(2) For the purposes of subregulation (1)(b), a quality assurance programme shall not be suitable if it does not require-

(a) in respect of any equipment brought into use for the first time after the coming into force of these Regulations, the carrying out of adequate testing of such equipment before it is first used for clinical purposes;

(b) the carrying out of adequate testing of the performance of the equipment at appropriate intervals and after any major maintenance procedure to that equipment; and

(c) where appropriate, the carrying out of such measurements at suitable intervals as are necessary to enable representative doses of ionising radiation received by persons undergoing medical exposures to be assessed.

(3) Every employer who has control, to any extent, of any radiation equipment which is used for the purpose of diagnosis and which is installed after the date of the coming into force of these Regulations shall ensure, having regard to the extent of his control, that, where practicable, such equipment is provided with a device or other suitable means for informing the user of that equipment of the quantity of radiation produced by that equipment during a radiological procedure.

(4) Where failure of any radiation equipment could result in an exposure to ionising radiation greater than that intended, any employer who has control, to any extent, of such equipment shall take all such steps as are reasonably practicable to prevent any such failure and to limit the consequences thereof.

(5) Where a radiation employer suspects or has been informed that an incident may have occurred in which a person was exposed to ionising radiation to a much greater extent that that intended, as a result of a malfunction of, or defect in, any radiation equipment under the control of the employer, he shall-

(a) make an immediate investigation of the suspected incident; and

(b) unless the immediate investigation shows beyond reasonable doubt that no such incident has occurred-

(i) notify the suspected incident to the competent authority forthwith;

(ii) make or arrange for a detailed investigation to be made of the circumstances of the exposure; and

(iii) arrange for an assessment to be made of the dose of ionising radiation received by the person affected.

(6) Where an investigation is made pursuant to subregulation (5)(a) or 5(b)(ii), the radiation employer shall-

(a) make a report of that investigation; and

(b) (i) in the case of an immediate investigation made pursuant to subregulation (5)(a), keep that report or a copy thereof for a period of at least 2 years from the date on which it was completed; and

(ii) in the case of a detailed investigation made pursuant to subregulation (5)(b)(ii), keep that report or a copy thereof for a period of at least 50 years from the date on which it was completed.

(7) In this regulation, "radiation equipment" means equipment which delivers ionising radiation to the person undergoing a medical exposure and equipment which directly controls the extent of the exposure.

Misuse of or interference with sources of ionising radiation.

35. No person shall intentionally or recklessly misuse or, without reasonable excuse, interfere with any radioactive substance or any equipment to which these Regulations apply.

PART VII

DUTIES OF EMPLOYEES, ENFORCEMENT AND MISCELLANEOUS PROVISIONS

Duties of employees.

36.(1) An employee who is engaged in work with ionising radiation shall-

(a) not knowingly expose himself or any other person to ionising radiation to an extent greater than is reasonably necessary for the purposes of his work; and

(b) exercise reasonable care while carrying out such work.

(2) Every employee who is provided with personal protective equipment pursuant to regulation 9(2)(c) shall-

(a) make full and proper use of such equipment;

(b) report forthwith to his employer any defect he discovers in any such equipment; and

(c) take all reasonable steps to ensure that such equipment is returned after use to the accommodation provided for it.

(3) No outside worker shall-

(a) misuse the radiation passbook issued to him; or

(b) falsify, or attempt to falsify, any of the information contained in such passbook.

(4) Where an employer is required by these Regulations to arrange for a dose assessment to be made in relation to any employee, that employee shall comply with any reasonable requirement imposed upon him by his employer for that purpose.

(5) An employee who is subject to medical surveillance pursuant to regulation 26 shall-

(a) present himself during his working hours, when required by and at the cost of his employer, for such medical examination and tests as may be required for the purposes of subregulation (2) of that regulation; and

(b) provide the appointed doctor with such information concerning his health as the said doctor may reasonably require.

(6) Where an employee has reasonable cause to believe that-

(a) he or some other person has received an overexposure;

(b) an incident referred to in subregulation (1) or (2) of regulation 32 has occurred; or

(c) an incident referred to in subregulation (5) of regulation 34 has occurred,

he shall notify his employer forthwith of that belief.

Approval of dosimetry services.

37.(1) Subject to sub-regulation (2) below the competent authority (or such other person as may be specified in writing by the authority from time to time) may approve, in accordance with such criteria as may be specified by it and by a certificate in writing, a dosimetry service for such of the purposes of these Regulations or of the Radiation (Emergency Preparedness and Public Information) Regulations 2004 as are specified in the certificate and any such approval may be granted subject to conditions and may be revoked by a certificate in writing at any time.

(2) The competent authority (or such other person as may be specified in writing by the authority from time to time) shall approve, in accordance with such criteria as are specified by it and by a certificate in writing, a dosimetry service for the purposes mentioned in sub-regulation (1) that has been approved by the appropriate authority for use in the UK for the same purpose.

(3) The competent authority (or such other person as may be specified in writing by the authority from time to time) may carry out, at such suitable intervals as it considers appropriate, a re-assessment of any approval granted pursuant to subregulation (1).

Exemption certificates.

38.(1) Subject to subregulation (2), the competent authority may exempt, by a certificate in writing-

(a) any person or class of persons;

(b) any premises or class of premises; or

(c) any equipment or substance, or class of equipment or substance,

from any requirement or prohibition imposed by these Regulations and any such exemption may be granted subject to conditions and to a limit of time and may be revoked by a certificate in writing at any time.

(2) The competent authority shall not grant an exemption pursuant to subregulation (1) unless, having regard to the circumstances of the case and in particular to-

(a) the conditions, if any, which it proposes to attach to the exemption; and

(b) any other requirements imposed by or under any enactments which apply to the case,

it is satisfied that-

(c) the health and safety of persons who are likely to be affected by the exemption will not be prejudiced in consequence of it; and

(d) compliance with the fundamental radiation protection provisions underlying regulations 9(1) and (2)(a), 12, 13(1), 17(1), 18, 21(1), 22(1), 26(2) and 34(1) will be achieved.

Appointment and powers of inspectors.

39.(1) The competent authority may appoint as inspectors (under whatever title it may from time to time determine) such persons having suitable qualifications as it thinks necessary for the purpose of enforcing these Regulations.

(2) Every appointment of a person as an inspector under this regulation shall be made by an instrument in writing, specifying which of the powers conferred on inspectors by these Regulations are to be exercisable by that person, which powers may be varied at any time by the competent authority by a further instrument in writing and an inspector shall be entitled to exercise only those powers which are so specified.

(3) When exercising or seeking to exercise any of the powers specified in his instrument of appointment, an inspector shall produce such instrument or a duly authenticated copy thereof, if so required.

(4) An inspector may-

(a) at any reasonable time (or, in a situation which in his opinion is or may be dangerous, at any time) enter any premises in which any person is carrying on or proposes to carry on, any activity falling within these Regulations, for the purpose of ascertaining whether any such person, premises and equipment on such premises complies with these Regulations;

(b) make such examination and investigation as may be necessary for the purpose mentioned in paragraph (a);

(c) require any person whom he has reasonable cause to believe to be able to give any information relevant to any examination or investigation carried out under paragraph (b) to answer (in the absence of persons other than a person nominated by him to be present and any person whom the inspector may allow to be present) such questions as the inspector thinks fit to ask and to sign a declaration of the truth of his answers;

(d) require the production of, inspect and take copies of or of any entry in-

(i) any books or documents which by virtue of any of these Regulations are required to be kept; and

(ii) any other books or documents which it is necessary for him to see for the purposes of any examination or investigation under paragraph (b);

(e) require any person to afford him such facilities and assistance with respect to any matter or things within that person's control or in relation to which that person has responsibilities as are necessary to enable the inspector to exercise any of the powers conferred on him by this regulation;

(f) exercise any other power which is necessary for the purpose mentioned in paragraph (a).

(5) Any information obtained by an inspector in exercise of his powers under these Regulations shall-

(a) except as is necessary for the purpose of a disclosure to which paragraph (b)(iii) applies, have erased from it the name of any person who has received treatment, together with any details which might enable any such person to be identified;

(b) be used only for the purpose of giving effect to the obligations of the competent authority under these Regulations and shall not be disclosed to any other person except-

(i) in the prosecution of an offence under regulation 45;

(ii) to an expert or advisor engaged by the competent authority to provide to the authority information, analysis or advice for the purpose of enabling the authority to enforce these Regulations, and such person shall be subject to the like obligation of confidentiality as by this regulation is imposed on the authority;

(iii) to any person who by reason of having received treatment, in the opinion of the authority, should be so informed.

(6) For the purpose of this regulation, "received treatment" means having been-

(a) the subject of the administration of a radioactive medicinal product; or

(b) subject to a medical exposure,

to which these Regulations apply.

Improvement notices.

40. If an inspector is of the opinion that a person–

(a) is contravening one or more of these Regulations; or

(b) has contravened one or more of those provisions in circumstances that make it likely that the contravention will continue to be repeated,

he may serve on him a notice ("an improvement notice") stating that he is of that opinion, specifying the provision or provisions as to which he is of that opinion, giving particulars of the reasons why he is of that opinion, and requiring that person to remedy the contravention or, as the case may be, the matters occasioning it within such period (ending not earlier than the period within which an appeal against the notice can be brought under regulation 42) as may be specified in the notice.

Prohibition notices.

41.(1) This regulation applies to any activities which are being or are likely to be carried on by or under the control of any person, being activities to or in relation to which any of these Regulations apply or will, if the activities are so carried on, apply.

(2) If as regards any activities to which this regulation applies an inspector is of the opinion that, as carried on or likely to be carried on by or under the control of the person in question, the activities involve or, as the case may be, will involve a risk of serious personal injury, the inspector may serve on that person a notice ("a prohibition notice").

(3) A prohibition notice shall–

(a) state that the inspector is of that opinion;

(b) specify the matters which in his opinion give or, as the case may be, will give rise to that risk;

(c) where in his opinion any of those matters involves or, as the case may be, will involve a contravention of any of these Regulations, state that he is of that opinion, specify the provision or provisions as to which he is of that opinion, and give particulars of the reasons why he is of that opinion; and

(d) direct that the activities to which the notice relates shall not be carried on by or under the control of the person on whom the notice is served unless the matters specified in the notice in pursuance of paragraph (b) and any associated contraventions of provisions so specified in pursuance of paragraph (c) have been remedied.

(4) A direction given in pursuance of subregulation (3)(d) shall take effect-

(a) at the end of the period specified in the notice; or

(b) immediately, if the notice so declares.

Provisions supplementary to regulations 40 and 41.

42.(1) In this regulation "a notice" means an improvement notice or a prohibition notice.

(2) Where a notice which is not to take immediate effect has been served–

(a) the notice may be withdrawn by an inspector at any time before the end of the period specified therein in pursuance of regulation 40 or regulation 41(4), as the case may be; and

(b) the period so specified may be extended or further extended by an inspector at any time when an appeal against the notice is not pending.

Appeal against improvement or prohibition notice.

43.(1) In this regulation "a notice" means an improvement notice or a prohibition notice.

(2) A person on whom a notice is served may appeal, within 21 days from the date of its service, to the Employment Tribunal and on such an appeal the Tribunal may either cancel or affirm the notice and, if it affirms it, may do so either in its original form or with such modifications as the Tribunal may in the circumstances think fit.

(3) Where an appeal under this regulation is brought against a notice within the period allowed under subregulation (2) then–

(a) in the case of an improvement notice, the bringing of the appeal shall have the effect of suspending the operation of the notice until the appeal is finally disposed of or, if the appeal is withdrawn, until the withdrawal of the appeal;

(b) in the case of a prohibition notice, the bringing of the appeal shall have the like effect if, on the application of the appellant, the Tribunal so directs (and then only from the giving of the direction).

Power to deal with cause of imminent danger.

44.(1) Where, in the case of any article or substance found by him in any premises which he has power to enter, an inspector has reasonable cause to believe that, in the circumstances in which he finds it, the article or substance is a cause of imminent danger or serious personal injury, he may seize it and cause it to be rendered harmless (whether by destruction or otherwise).

(2) Before there is rendered harmless under this regulation–

(a) any article that forms part of a batch of similar articles; or

(b) any substance,

the inspector shall, if it is practicable for him to do so, take a sample thereof and give to a responsible person at the premises where the article or substance was found by him a portion of the sample marked in a manner sufficient to identify it.

(3) As soon as may be after any article or substance has been seized and rendered harmless under this regulation, the inspector shall prepare and sign a written report giving particulars of the circumstances in which the article or substance was seized and so dealt with by him, and shall–

(a) give a signed copy of the report to a responsible person at the premises where the article or substance was found by him; and

(b) unless that person is the owner of the article or substance, serve a signed copy of the report on the owner;

and if, where paragraph (b) applies, the inspector cannot after reasonable enquiry ascertain the name or address of the owner, the copy may be served on him by giving it to the person to whom a copy was given under paragraph (a).

Offences and penalties.

45.(1) It is an offence for a person to–

(a) fail to discharge a duty imposed upon him by any of these Regulations;

(b) contravene any requirement or prohibition imposed by any of these Regulations;.

(c) contravene any requirement or prohibition to which he is subject by virtue of any condition attached to an exemption granted under regulation 38.

(2) A person guilty of an offence under subregulation (1) is liable on summary conviction to a fine of four times the amount at level 5 on the standard scale.

(3) Where an offence under these Regulations committed by a body corporate is proved to have been committed with the consent or connivance of, or to have been attributable to any neglect on the part of, any director, manager, secretary or other similar officer of the body corporate or a person who was purporting to act in any such capacity he, as well as the body corporate, is guilty of that offence and is liable to be proceeded against and punished accordingly.

(4) Where the commission by any person of an offence under these Regulations is due to the act or default of some other person, that person is guilty of the offence, and a person may be charged with and convicted of the offence by virtue of this subregulation whether or not proceedings are taken against the first mentioned person.

(5) Where there would be or would have been the commission of an offence under this regulation by the Crown but for the circumstance that, by virtue of regulation 52(1), this regulation does not bind the Crown, and that fact is due to the act or default of a person other than the Crown, that person is guilty of an offence which, but for that circumstance, the Crown would be committing or would have committed, and may be charged with and convicted of that offence accordingly.

Defences.

46.(1) In any proceedings against any person for an offence under regulation 5(1) or (3), it shall be a defence for that person to prove that he neither knew nor had reasonable cause to believe that his actions were in contravention of that subregulation.

(2) In any proceedings against an employer for an offence under regulation 7(2), it shall be a defence for that employer to prove that-

(a) he neither knew nor had reasonable cause to believe that he had carried out or that his work might involve carrying out work subject to notification under that provision; and

(b) in a case where he discovered that he had carried out or was carrying out work subject to notification under that provision, he had forthwith-

(i) notified the competent authority of his discovery; and

(ii) provided the authority with the particulars required by that provision.

(3) In any proceedings against an employer for an offence under regulation 8, it shall be a defence for that employer to prove that-

(a) he neither knew nor had reasonable cause to believe that he had commenced a new activity involving work with ionising radiation; and

(b) in a case where he had discovered that he had commenced a new activity involving work with ionising radiation, he had made a risk assessment in accordance with the requirements of that regulation, as soon as was practicable following his discovery.

(4) In any proceedings against an employer for an offence under regulation 29(2) it shall be a defence for the employer to prove that-

(a) he had received and reasonably relied upon a written statement from the supplier of the article concerned that it complied with the requirements of that provision; and

(b) he had complied with the requirements of regulation 29(3).

(5) In any proceedings for a breach of duty in contravention of these Regulations against an employer of an outside worker it shall be a defence for that employer to prove that-

(a) he had entered into a contract in writing with the employer who had designated an area as a controlled area and in which the outside worker was working or was to work for that employer, for that employer to perform that duty on his behalf; and

(b) the breach of duty was a result of the failure of that employer to fulfil his obligation under the contract to perform that duty.

(6) In any proceedings for a breach of duty in contravention of these Regulations against an employer who has designated an area as a controlled area in which any outside worker is working or is to work it shall be a defence for that employer to prove that-

(a) he had entered into a contract in writing with the employer of that outside worker, for that employer to perform that duty on his behalf; and

(b) the breach of duty was a result of a failure of that employer to fulfil his obligation under the contract to perform that duty.

(7) The person charged shall not be entitled, without leave of the court, to rely upon the defence referred to in subregulation (4) or (5) unless, within a period ending seven clear days before the hearing, he has served on the prosecutor a notice in writing that he intends to so rely and that notice is accompanied by a copy of the relevant contract and, if that contract is not in English, an accurate translation of that contract into English.

(8) Where a contravention of these Regulations by any person is due to the act or default of some other person, that other person is guilty of the offence which, (but for any defence available to the first person under this regulation), would be constituted by the act or default.

Onus of proving limits of what is practicable etc.

47. In any proceedings for an offence in contravention of these Regulations consisting of a failure to comply with a duty or requirement to do something so far as is practicable or so far as is reasonably practicable, it shall be for the accused to prove (as the case may be) that it was not practicable or not reasonably practicable to do more than was in fact done to satisfy the duty or requirement.

Evidence.

48.(1) Where an entry is required by any of these Regulations to be made in any register or other record, the entry, if made, shall, as against the person by or on whose behalf it was made, be admissible as evidence of the facts stated therein.

(2) Where an entry which is required to be made in any register or other record with respect to the observance of any of these Regulations has not been made, that fact shall be admissible as evidence that that regulation has not been observed.

Fees.

49.(1) Where the competent authority incurs costs in carrying out its functions under these Regulations it may charge a fee determined in accordance with subregulations (2) and (3), to any person carrying on in Gibraltar any activity to which these Regulations apply.

(2) The fee charged pursuant to subregulation (1) shall not exceed the sum of the costs reasonably incurred by the competent authority in respect of the application of these Regulations to the activity of that person and where the costs incurred are in respect of more than one person carrying on in

Gibraltar an activity to which these Regulations apply the fee charged to each such person shall not exceed the proportion of such sum attributable to the activity or activities of that person.

(3) Where, in the opinion of the competent authority, the authority can properly perform its functions under these Regulations only by engaging specialists and consultants, the cost of such specialists or consultants shall be included in the fee payable under subregulation (1).

(4) The competent authority shall determine the cost of employing an officer (including a public officer) for the period of time spent by that officer carrying out any of the authority's functions under these Regulations by reference to the average cost to the authority of employing officers of the appropriate grade for such period.

(5) When requiring payment the competent authority shall send or give to the person by whom the fee is payable a detailed statement of the work done and costs incurred and the period of time to which the statement relates and the fee shall be recoverable as a civil debt.

Civil liability.

50.(1) Breach of any duty or prohibition imposed by these Regulations, in so far as it causes damage, shall be actionable in civil proceedings.

(2) Any term of an agreement which purports to exclude or restrict the operation of subregulation (1), or any liability arising by virtue of that subregulation, shall be void.

(3) In this regulation "damage" includes the death of, or injury to, any person (including any disease and any impairment of a person's physical or mental condition).

Modifications relating to the Ministry of Defence etc.

51.(1) In this regulation, any reference to-

(a) "visiting forces" is a reference to visiting forces within the meaning of any provision of Part I of the Visiting Forces Act 1952; and

(b) "headquarters or organisation" is a reference to a headquarters or organisation designated for the purposes of the International Headquarters and Defence Organisations Act 1964.

(2) The Secretary of State for Defence may, in the interests of national security, by a certificate in writing exempt-

(a) Her Majesty's Forces;

(b) visiting forces;

(c) any member of a visiting force working or attached to any headquarters or organisation; or

(d) any person engaged in work with ionising radiation for, or on behalf of, the Secretary of State for Defence,

from all or any of the requirements or prohibitions imposed by these regulations and any such exemption may be granted subject to conditions and to a limit of time and may be revoked at any time by a certificate in writing, except that, where any such exemption is granted, suitable arrangements shall be made for the assessment and recording of doses of ionising radiation received by persons to whom the exemption relates.

(3) Regulation 7 shall not apply in relation to work carried out by, and on premises under the control of, the Secretary of State for Defence, visiting forces or any headquarters or organisation.

(4) The requirements in regulation 7 to notify the particulars specified in sub-paragraphs (d) and (e) of Schedule 2 or any of the particulars specified in Schedule 3 shall not apply to any employer in relation to work with ionising radiation undertaken for or on behalf of the Secretary of State for Defence, visiting forces or any headquarters or organisation.

(5) Regulation 25(2)(b) shall not apply in relation to-

(a) Her Majesty's Forces;

(b) visiting forces; or

(c) any member of a visiting force working in or attached to any headquarters or organisation.

(6) Regulation 26(9) shall not apply in relation to-

(a) Her Majesty's Forces;

(b) visiting forces; or

(c) any member of a visiting force working in or attached to any headquarters or organisation.

(7) The requirement in sub-regulations (2) to (5) of regulation 7 shall not have effect in any case where the Secretary of State for Defence decides that to do so would be against the interests of national security or where suitable alternative arrangements have been agreed with the Government.

(8) The requirements of sub-regulations (2) and (3) of regulation 13 shall not have effect to the extent that in any particular case they would, in the opinion of the Secretary of State for Defence, be against the interests of national security.

(9) In regulation 27(2) the requirement to notify a suspected overexposure and the results of the consequent investigation and assessment shall not apply in relation to the exposure of-

(a) a member of Her Majesty's Forces;

(b) a member of a visiting force; or

(c) a member of a visiting force working in or attached to a headquarters or organisation.

(10) The requirements of regulation 32(1) shall not apply to Her Majesty's ships except when undergoing refit.

(11) Regulation 39 shall not apply to visiting nuclear powered warships.

Application to the Crown.

52.(1) The provisions of these Regulations, except regulations 40 to 48, shall bind the Crown.

(2) Although they do not bind the Crown, regulations 40 to 48 shall apply to persons in the public service of the Crown, as they apply to other persons.

(3) For the purposes of these Regulations, persons in the service of the Crown shall be treated as employees of the Crown, whether or not they would be so treated apart from this subregulation.

Transitional provisions.

53.(1) Where on or before the coming into force of these regulations an employer commences for the first time work which is required to be notified under regulation 7(2), it shall be sufficient compliance with that regulation if the employer notifies the competent authority and provides the particulars required by that provision before the coming into force of these regulations.

(2) A contingency plan made pursuant to regulation 27 of the 1995 Regulations and which complied with that regulation immediately before the coming into force of these Regulations shall be treated, for the purposes of regulation 13, as if made pursuant to subregulation (1) of that regulation.

(3) A certificate of approval granted by the Government to a dosimetry service under regulation 15 of the 1995 Regulations and which is valid immediately before the date of coming into force of these Regulations, shall continue in force and shall be treated as if it had been granted under regulation 37 of these Regulations.

(4) A radiation passbook approved for the purposes of the Ionising Radiation (Outside Workers) Regulations 1995 and issued prior to the coming into force of these regulations in respect of an outside worker employed by an employer in Gibraltar and which was at that date valid shall remain valid for such time as the worker to whom the radiation passbook relates continues to be employed by the same employer.

(5) A doctor appointed in writing by the Government for the purposes of the 1995 Regulations prior to the coming into force of these Regulations shall be deemed to have been appointed for the purposes of these Regulations until such time as the period specified in the appointment expires or the appointment is revoked.

(6) Until 31 March 2005, an individual or body appointed by an employer as a radiation protection adviser for the purposes of the 1995 Regulations prior to the coming into force of these Regulations shall be deemed to meet the criteria of competence specified by the competent authority for such advisers under these Regulations.

(7) A health record made and maintained in accordance with regulation 16 of the 1995 Regulations prior to the coming into force of these Regulations shall remain valid for a period of 12 months from the date of the last entry made in it (or for such shorter period as may have been specified therein for the validity of the last entry by an appointed doctor under those Regulations) and such record shall be deemed, for that period, to have been made and maintained in accordance with regulation 26(3).

(8) An exemption granted by the Government pursuant to regulation 27(6) of the 1995 Regulations shall continue in force until such time as it is revoked by the Government, save that the exemption from the requirements of regulation 7 of the said 1995 Regulations shall be deemed to be an exemption from the requirements of regulation 12 of these Regulations.

(9) Until the coming into force of these regulations, where the competent authority has reasonable cause to believe that the dose of ionising radiation received by an employee was much greater or much less than that shown in

the relevant entry of the dose record (such record having been made and maintained in accordance with regulation 13 of the 1995 Regulations), the competent authority may approve an amendment to the dose record and in such a case the employer shall-

(a) arrange for the appropriate approved dosimetry service to amend the dose record and identify the amendment as a special entry; and

(b) give a copy of the amended dose record to the employee to whom it relates.

Modifications, revocations and savings.

54.(1) Subject to subregulation (2), the following enactments are hereby revoked−

(a) The Ionising Radiations Regulations 1995; and

(b) The Ionising Radiation (Outside Workers) Regulations 1995;

(2) Every certificate, register or record which was required to be kept in pursuance of any regulation revoked by that subregulation shall be kept in the same manner and for the same period as if these Regulations had not been made, except that the competent authority may approve the keeping of records at a place or in a form other than the place where, or the form in which, records were required to be kept under the regulation so revoked.

Application of Regulations in the implementation of article 53 of the Directive.

55.(1) This regulation applies where the competent authority has identified a situation leading to lasting exposure resulting from the after-effects of a radiological emergency or a past practice.

(2) Where this section applies, the competent authority shall apply these Regulations in such manner as ensures that -

(a) the relevant area concerned is demarcated;

(b) arrangements are made for the monitoring of exposure;

(c) any appropriate intervention is implemented, taking account of the real characteristics of the situation; and

(d) access to or use of land or buildings situated in the demarcated area is regulated.

(3) Any intervention by the competent authority pursuant to this regulation shall –

(a) be proportional to the extent of the risk involved;

(b) be undertaken only if the reduction in detriment due to radiation is sufficient to justify the harm and costs, including social costs, of the intervention;

(c) be optimised in its form, scale and duration so that the benefit of the reduction in health detriment less the detriment associated with the intervention will be maximised.

(4) Any act or omission contrary to the provisions of this regulation shall be an offence punishable on summary conviction by a fine at level 5 on the standard scale.

(5) Nothing in regulation 3 shall prejudice the application of this regulation in circumstances not falling within the scope of regulation 3.

(6) In this regulation -

"exposure" means the process of being exposed to ionising radiation;

"radiological emergency" shall be construed in accordance with regulation 2 of the Radiation (Emergency Preparedness and Public Information) Regulations 2004;

"intervention" means a human activity that prevents or decreases the exposure of individuals to radiation from sources which are not part of a practice or which are out of control, by acting on sources, transmission pathways and individuals themselves.

PART VIII
HIGH ACTIVITY SEALED RADIOACTIVE SOURCES AND ORPHAN SOURCES

Interpretation.

56.(1) In this Part–

"authorisation" means an authorisation granted under regulation 6 or regulation 57;

"existing high-activity source" means a high-activity source first placed on the market on or before 1 January 2006;

"the HASS Directive" means Council Directive 2003/122/EURATOM on the control of high-activity sealed radioactive sources and orphan sources;

"high-activity source" has the same meaning as it has in the HASS Directive but excluding any such source once its activity level has fallen below the exemption levels specified in column 2 of Table A to Annex I to the Directive reproduced in Schedule 9;

"orphan source" means a sealed source, the activity level of which, at the time of its discovery is above the exemption level referred to in Article 3(2)(a) of Directive 96/29/Euratom, and which is not under regulatory control (Article 3(2)(a) and Table A to Annex I of Directive 96/29/Euratom are reproduced for information purposes at Schedule 10).

(2) Unless otherwise stated, expressions used that appear in the HASS Directive have the same meaning in these Regulations as they do in the Directive.

Variation of authorisations.

57.(1) Subject to subregulations (2) and (5) where a person holds an authorisation in respect of any high-activity source and either–

(a) intends to dispose of or accumulate, or keep and use, a high-activity source (other than an existing high-activity source) on or after the date these regulations come into operation; or

(b) intends to dispose of or accumulate, or keep and use an existing high-activity source on or after 1st January 2008,

that person shall apply to the competent authority to vary his authorisation to enable the competent authority to ensure that the authorisation complies with the relevant provisions of the HASS Directive and that person shall make that application in accordance with subregulation (3).

(2) The competent authority may notify a person to whom subregulation (1) applies–

(a) that such person is not required to make an application under subregulation (1); or

(b) if it is satisfied that in its opinion exceptional circumstances apply to that person, that such person may make an application

within a period shorter than that provided for under sub regulation (3).

(3) Except where notification is given under subregulation (2)(b), the application under subregulation (1) shall be made–

(a) at least four months before the date the source is intended to be disposed of or accumulated; or

(b) in the case of a high-activity source (other than an existing high-activity source) which is intended to be disposed of or accumulated within four months of these Regulations coming into operation, as soon as practicable and in any event at least two weeks before the date of intended disposal or accumulation of the source.

(4) If a person fails to make an application in accordance with subregulation (3) his authorisation shall be revoked by the competent authority in so far as it relates to the high-activity source in question.

(5) In considering an application under regulation 6(1)(e) or an application under subregulation (1) the competent authority must ensure that the application or authorisation complies with Articles 3(2) and (3) of the HASS Directive and that appropriate limitations and conditions are attached to the authorisation and where necessary that such authorisation is made subject to such limitations and conditions as are required for compliance with Articles 5(1) and (2), 6, 7(1) and (2) and 16(1)(b) of the HASS Directive.

Transfer of high activity source.

58. Where an application for the transfer of a high activity source is made under regulation 57 the competent authority shall impose such limitation or conditions to the authorisation as may be required to enable it to be informed of and keep adequate records of such transfers.

Site security.

59.(1) Where the following material is, or will be, kept, used, disposed of or accumulated on any premises–

(a) high-activity sources; or

(b) other sealed sources which, in the opinion of the competent authority, are of a similar level of potential hazard to high-activity sources,

the competent authority, in considering if the measures taken, or to be taken, by the applicant or person granted the authorisation ensure the adequate security of any premises, shall where it, considers it appropriate–

(i) inspect those premises; and

(ii) consult with the police and such other persons as it, or he, considers appropriate concerning the measures.

(2) Where subregulation (1) applies, the competent authority shall have regard to any advice it, receives from the police or other persons within such time as it believes is reasonable before–

(a) determining the authorisation or effecting any variation or cancellation of the authorisation; or

(b) imposing any limitations and conditions on the authorisation.

(3) Where the competent authority inspects any premises under subregulation (1) it may be accompanied by such other persons as are appropriate to assist it in assessing the measures.

(4) An applicant or person holding authorisation shall permit the competent authority (and any person accompanying them) reasonable access to any premises it, wishes to inspect under subregulation (1).

(5) If an applicant or person holding authorisation fails to comply with subregulation (4), the competent authority may refuse the application or cancel or revoke the authorisation insofar as it relates to the sources referred to in sub regulation (1).

Records and inspections.

60. The competent authority shall–

(a) keep records of those matters–

(i) required by Articles 5(3) and (4) of the HASS Directive; and

(ii) notified to it, him or them under Article 6 of that Directive;

and

(b) establish or maintain a system of inspections to enforce the provisions of Articles 3, 4, 5 and 6, and 7 (subject to Article

16(1)(b)) of the HASS Directive which must be complied with by persons holding authorisations.

Advice and assistance in respect of orphan sources.

61.(1) The competent authority shall ensure that–

(a) in relation to the public and workers, specialised technical advice and assistance is promptly made available to such persons who are not normally involved in operations subject to radiation protection requirements and who suspect the presence of an orphan source; and

(b) the primary aim of such advice and assistance is–

(i) the safety of the source; and

(ii) the protection of the public and workers from radiation.

Directions.

62. Where the Minister gives directions to the competent authority under this regulation for the purpose of implementing provisions of the HASS Directive the following requirements apply–

(a) any direction shall be published in such manner as the Minister considers appropriate for the purpose of bringing the matters to which it relates to the attention of persons likely to be affected by it;

(b) copies of a direction shall be made available to the public;

(c) notice of a direction and of where a copy may be obtained shall be published in the Gazette;

(d) no direction shall be varied or revoked unless, notwithstanding the variation or revocation, the provisions of the HASS Directive as they have effect for the time being which were implemented by that direction, continue to be implemented, whether by directions or any other instrument or by any enactment.

Recovery and disposal of orphan sources.

63.(1) The competent authority shall be prepared or have made provision, including assignment of responsibilities, to recover any orphan source and shall have drawn up appropriate response plans and measures.

(2) The competent authority shall have the power to recover any expenses reasonably incurred by it (or by a person on its behalf) in the recovery and disposal of an orphan source from the holder of that source or from the occupier or owner of the premises where the source is located.

(3) For the purposes of subregulation (2) "holder" means the person who is or is required to be authorised under these regulations in relation to that orphan source.

IONISING RADIATION REGULATIONS 2004

Subsidiary 2004/088

SCHEDULE 1

Regulations 7(1) and 14(3)

WORK NOT REQUIRED TO BE NOTIFIED UNDER REGULATION 7

Work with ionising radiation shall not be required to be notified in accordance with regulation 7 when the only such work being carried out is in one or more of the following categories-

(a) where the concentration of activity per unit mass of a radioactive substance does not exceed the concentration specified in column 2 of Part I of Schedule 8;

(b) where the quantity of radioactive substance involved does not exceed the quantity specified in column 3 of Part I of Schedule 8;

(c) where apparatus contains radioactive substances in a quantity exceeding the values specified in subparagraphs (a) and (b) above provided that–

(i) the apparatus is of a type approved by the competent authority;

(ii) the apparatus is constructed in the form of a sealed source;

(iii) the apparatus does not under normal operating conditions cause a dose rate of more than $1uSvh^{-1}$ distance of 0.lm from any accessible surface; and at

(iv) conditions for the disposal of the apparatus have been specified by the appropriate Agency;

(d) the operation of any electrical apparatus to which these Regulations apply other than apparatus referred to in subparagraph (e) below, provided that-

(i) the apparatus is of a type approved by the competent authority; and

(ii) the a pparatus does not under normal operating conditions cause a dose rate of more than $luSvh^{-1}$ at a distance of 0.lm from any accessible surface;

(e) the operation of-

(i) any cathode ray tube intended for the display of visual images; or

(ii) any other electrical apparatus operating at a potential difference not exceeding 30kv provided that the operation of the tube or apparatus does not under normal operating conditions cause a dose rate of more than $1uSvh^{-1}$ at a distance of 0.1m from any accessible surface;

(f) where the work involves material contaminated with radioactive substances resulting from authorised releases which the appropriate Agency has declared not to be subject to further control.

SCHEDULE 2

Regulation 7(2)

PARTICULARS TO BE PROVIDED IN A NOTIFICATION UNDER REGULATION 7(2)

The following particulars shall be given in a notification under regulation 7(2)–

(a) the name and address of the employer and a contact telephone or fax number or electronic mail address;

(b) the address of the premises where or from where the work activity is to be carried out and a telephone or fax number or electronic mail address at such premises;

(c) the nature of the business of the employer;

(d) into which of the following categories the source or sources of ionising radiation fall-

(i) sealed source;

(ii) unsealed radioactive substance;

(iii) electrical equipment;

(iv) an atmosphere containing the short-lived daughters of radon 222;

(e) whether or not any source is to be used at premises other than the address given at subparagraph (b) above; and

(f) dates of notification and commencement of the work activity.

SCHEDULE 3

Regulation 7(3)

ADDITIONAL PARTICULARS WHICH THE COMPETENT AUTHORITY MAY REQUIRE

The following additional particulars may be required under regulation 7(3)-

(a) a description of the work with ionising radiation;

(b) particulars of the source or sources of ionising radiation including the type of electrical equipment used or operated and the nature of any radioactive substance;

(c) the quantities of any radioactive substance involved in the work;

(d) the identity of any person engaged in the work;

(e) the date of commencement and the duration of any period over which the work is carried on;

(f) the location and description of any premises at which the work is carried out on each occasion that it is so carried out;

(g) the date of termination of the work;

(h) further information on any of the particulars listed in Schedule 2.

IONISING RADIATION REGULATIONS 2004

Subsidiary 2004/088

SCHEDULE 4

Regulation 12

DOSE LIMITS

PART I

CLASSES OF PERSONS TO WHOM DOSE LIMITS APPLY

Employees of 18 years of age or above.

1. For the purposes of regulation 12(1), the limit on effective dose for any employee of 18 years of age or above shall be 20 mSv in any calendar year.

2. Without prejudice to paragraph 1–

(a) the limit on equivalent dose for the lens of the eye shall be 150 mSv in a calendar year;

(b) the limit on equivalent dose for the skin shall be 500 mSv in a calendar year as applied to the dose averaged over any area of l cm^2 regardless of the area exposed;

(c) the limit on equivalent dose for the hands, forearms, feet and ankles shall be 500 mSv in a calendar year.

Trainees aged under 18 years.

3. For the purposes of regulation 12(1), the limit on effective dose for any trainee under 18 years of age shall be 6 mSv in any calendar year.

4. Without prejudice to paragraph 3–

(a) the limit on equivalent dose for the lens of the eye shall be 50 mSv in a calendar year;

(b) the limit on equivalent dose for the skin shall be 150 mSv in a calendar year as applied to the dose averaged over any area of 1 cm^2 regardless of the area exposed;

(c) the limit on equivalent dose for the hands, forearms, feet and ankles shall be 150 mSv in a calendar year.

Women of reproductive capacity.

5. Without prejudice to paragraphs 1 and 3, the limit on equivalent dose for the abdomen of a women of reproductive capacity who is at work, being the equivalent dose from external radiation resulting from exposure to ionising radiation averaged throughout the abdomen, shall be 13 mSv in any consecutive period of three months.

Other persons.

6. Subject to paragraph 7, for the purposes of regulation 12(1) the limit on effective dose for any person other than an employee or trainee referred to in paragraph 1 or 3, including any person below the age of 16, shall be 1 mSv in any calendar year.

7. Paragraph 6 shall not apply in relation to any person (not being a comforter or carer) who may be exposed to ionising radiation resulting from the medical exposure of another and in such a case the limit on effective dose for any such person shall be 5 mSv in any period of 5 consecutive calendar years.

8. Without prejudice to paragraphs 6 and 7–

(a) the limit on equivalent dose for the lens of the eye shall be 15 mSv in any calendar year;

(b) the limit on equivalent dose for the skin shall be 50 mSv in any calendar year averaged over any 1 cm^2 area regardless of the area exposed;

(c) the limit on equivalent dose for the hands, forearms, feet and ankles shall be 50 mSv in a calendar year.

PART II

9. For the purposes of regulation 12(2), the limit on effective dose for employees of 18 years or above shall be 100 mSv in any period of five consecutive calendar years subject to a maximum effective dose of 50 mSv in any single calendar year.

10. Without prejudice to paragraph 9-

(a) the limit on equivalent dose for the lens of the eye shall be 150 mSv in a calendar year;

(b) the limit on equivalent dose for the skin shall be 500 mSv in a calendar year as applied to the dose averaged over any area of l cm^2 regardless of the area exposed;

(c) the limit on equivalent dose for the hands, forearms, feet and ankles shall be 500 mSv in a calendar year.

11. Without prejudice to paragraph 9, the limit on equivalent dose for the abdomen of a woman of reproductive capacity who is at work, being the equivalent dose from external radiation resulting from exposure to ionising radiation averaged throughout the abdomen, shall be 13 mSv in any consecutive period of three months.

12. The employer shall ensure that any employee in respect of whom regulation 12(2) applies is not exposed to ionising radiation to an extent that any dose limit specified in paragraphs 9 to 11 is exceeded.

13. An employer shall not put into effect a system of dose limitation in pursuance of regulation 12(2) unless–

(a) the radiation protection adviser and any employees who are affected have been consulted;

(b) any employees affected and the approved dosimetry service have been informed in writing of the decision and of the reasons for that decision; and

(c) notice has been given to the competent authority at least 28 days (or such shorter period as the competent authority may allow) before the decision is put into effect giving the reasons for the decision.

14. Where there is reasonable cause to believe that any employee has been exposed to an effective dose greater than 20 mSv in any calendar year, the employer shall, as soon as is practicable-

(a) undertake an investigation into the circumstances of the exposure for the purpose of determining whether the dose limit referred to in paragraph 9 is likely to be complied with; and

(b) notify the competent authority of that suspected exposure.

15. An employer shall review the decision to put into effect a system of dose limitation pursuant to regulation 12(2) at appropriate intervals and in any event not less than once every five years.

16. Where as a result of a review undertaken pursuant to paragraph 15 an employer proposes to revert to a system of annual dose limitation pursuant to regulation 12(1), the provisions of paragraph 13 shall apply as if the reference in that paragraph to regulation 12(2) was a reference to regulation 12(1).

17. Where an employer puts into effect a system of dose limitation in pursuance of regulation 12(2), he shall record the reasons for that decision and shall ensure that the record is preserved for a period of 50 years from the date of its making.

18. In any case where-

(a) the dose limits specified in paragraph 9 are being applied by a radiation employer in respect of an employee; and

(b) the competent authority is not satisfied that it is impracticable for that employee to be subject to the dose limit specified in paragraph 1 of Part I of this Schedule,

the authority may require the employer to apply the dose limit specified in paragraph 1 of Part I with effect from such time as the authority may consider appropriate, having regard to the interests of the employee concerned.

19. In any case where, as a result of a review undertaken pursuant to paragraph 15, an employer proposes to revert to an annual dose limitation in accordance with regulation 12(2), the competent authority may require the employer to defer the implementation of that decision to such time as the authority may consider appropriate, having regard to the interests of the employee concerned.

20. Any person who is aggrieved by the decision of the competent authority taken pursuant to paragraphs 18 or 19 may appeal to the Minister with responsibility for the Environment.

21. Subregulations (6) to (9) of regulation 6 shall apply for the purposes of paragraph 20 as they apply to an appeal under that regulation.

IONISING RADIATION REGULATIONS 2004

Subsidiary 2004/088

SCHEDULE 5

Regulation 14(1)

MATTERS IN RESPECT OF WHICH A RADIATION PROTECTION ADVISER MUST BE CONSULTED BY A RADIATION EMPLOYER

1. The implementation of requirements as to controlled and supervised areas.

2. The prior examination of plans for installations and the acceptance into service of new or modified sources of ionising radiation in relation to any engineering controls, design features, safety features and warning devices provided to restrict exposure to ionising radiation.

3. The regular calibration of equipment provided for monitoring levels of ionising radiation and the regular checking that such equipment is serviceable and correctly used.

4. The periodic examination and testing of engineering controls. design features, safety features and warning devices and regular checking of systems of work provided to restrict exposure to ionising radiation.

IONISING RADIATION REGULATIONS 2004
SCHEDULE 6

Regulation 23(6)

PARTICULARS TO BE ENTERED IN THE RADIATION PASSBOOK

1. Individual serial number of the passbook.

2. A statement that the passbook has been approved by the competent authority for the purposes of these Regulations.

3. Date of issue of the passbook by the approved dosimetry service.

4. The name, telephone number and mark of endorsement of the issuing approved dosimetry service.

5. The name, address, telephone and telex/fax number of the employer.

6. Full name (surname and forenames), date of birth, gender and national insurance number of the outside worker to whom the passbook has been issued.

7. Date of the last medical review of the outside worker and the relevant classification in the health record maintained under regulation 26 as fit, fit subject to conditions (which conditions shall be specified) or unfit.

8. The relevant dose limits applicable to the outside worker to whom the passbook has been issued.

9. The cumulative dose assessment in mSv for the year to date for the outside worker, external (whole body, organ or tissue) and/or internal, as appropriate, and the date of the end of the last assessment period.

10. In respect of services performed by the outside worker-

(a) the name and address of the employer responsible for the controlled area;

(b) the period covered by the performance of the services;

(c) estimated dose information, which shall be, as appropriate-

(i) an estimate of any whole body effective dose in mSv received by the outside worker;

(ii) in the event of non-uniform exposure, an estimate of the equivalent dose in mSv to organs and tissues as appropriate; and

(iii) in the event of internal contamination, an estimate of the activity taken in or the committed dose.

SCHEDULE 7

Regulation 26(3)

PARTICULARS TO BE CONTAINED IN A HEALTH RECORD

The following particulars shall be contained in a health record made for the purposes of regulation 26(3)-

(a) the employee's-

(i) full name;

(ii) sex;

(iii) date of birth;

(iv) permanent address; and

(v) Identity card number;

(b) the date of the employee's commencement as a classified person in present employment;

(c) the nature of the employee's employment;

(d) in the case of a female employee, a statement as to whether she is likely to receive in any consecutive period of three months an equivalent dose of ionising radiation for the abdomen exceeding 13 mSv;

(e) the date of last medical examination or health review carried out in respect of the employee;

(f) the type of the last medical examination or health review carried out in respect of the employee;

(g) a statement by the appointed doctor made as a result of the last medical examination or health review carried out in respect of the employee classifying the employee as fit, fit subject to conditions (which conditions shall be specified) or unfit;

(h) in the case of a female employee in respect of whom a statement has been made under subparagraph (d) above to the effect that she is likely to receive in any consecutive period of three months an equivalent dose of ionising radiation for the abdomen exceeding 13 mSv, a statement by the appointed

doctor certifying whether in his professional opinion the employee should be subject to the additional dose limit specified in paragraphs 5 and 11 of Schedule 4;

(i) in relation to each medical examination and health review, the name and signature of the appointed doctor;

(j) the name and address of the approved dosimetry service with whom arrangements have been made for maintaining the dose record in accordance with regulation 23.

IONISING RADIATION REGULATIONS 2004

SCHEDULE 8

Regulation 2(4) and
31(1) and (2)
and Schedule 1

QUANTITIES AND CONCENTRATIONS OF RADIONUCLIDES

PART I

TABLE OF RADIONUCLIDES

1	2	3	4	5
Radionuclide name, symbol isotope	**Concentration for notification. Regulation 6 and Schedule 1 (Bq/g)**	**Quantity for notification. Regulation 6 and Schedule 1 (Bq)**	**Quantity for notification of incidents. Regulation 31(1) (Bq)**	**Quantity for notification of incidents. Regulation 31(2) (Bq)**
Hydrogen				
Tritiated Compounds	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{12}$	$1\ 10^{10}$
Elemental	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{13}$	$1\ 10^{10}$
Beryllium				
Be-7	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Be-10	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Carbon				
C-11	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
C-11 monoxide	$1\ 10^{1}$	$1\ 10^{9}$	$1\ 10^{12}$	$1\ 10^{10}$
C-11 dioxide	$1\ 10^{1}$	$1\ 10^{9}$	$1\ 10^{12}$	$1\ 10^{10}$
C-14	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
C-14 monoxide	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{14}$	$1\ 10^{12}$
C-14 dioxide	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{13}$	$1\ 10^{12}$
Nitrogen				

N-13	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Oxygen				
O-15	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{10}$	
Fluorine				
F-18	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Neon				
Ne-19	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Sodium				
Na-22	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Na-24	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Magnesium				
Mg-28+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Aluminium				
Al-26	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Silicon				
Si-31	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Si-32	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Phosphorus				
P-32	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
P-33	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{9}$
Sulphur				
S-35	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{9}$
S-35 (organic)	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{12}$	$1\ 10^{9}$
S-35 Vapour	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{12}$	
Chlorine				
Cl-36	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$

Cl-38	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Cl-39	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Argon				
Ar-37	$1\ 10^{6}$	$1\ 10^{8}$	$1\ 10^{13}$	
Ar-39	$1\ 10^{7}$	$1\ 10^{4}$	$1\ 10^{12}$	
Ar-41	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Potassium				
K-40	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
K-42	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
K-43	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
K-44	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
K-45	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Calcium				
Ca-41	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Ca-45	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Ca-47	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Scandium				
Sc-43	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Sc-44	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Sc-44m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Sc-46	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Sc-47	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Sc-48	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Sc-49	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Titanium				
Ti-44 +	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{9}$	$1\ 10^{6}$
Ti-45	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Vanadium				
V-47	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
V-48	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$

V-49	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Chromium				
Cr-48	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Cr-49	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Cr-51	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Manganese				
Mn-51	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Mn-52	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Mn-52m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Mn-53	$1\ 10^{4}$	$1\ 10^{9}$	$1\ 10^{12}$	$1\ 10^{10}$
Mn-54	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Mn-56	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Iron				
Fe-52	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Fe-55	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Fe-59	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Fe-60+	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
Cobalt				
Co-55	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Co-56	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Co-57	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Co-58	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Co-58m	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Co-60	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Co-60m	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{16}$	$1\ 10^{7}$
Co-61	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Co-62m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Nickel				
Ni-56	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ni-57	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$

Ni-59	$1\ 10^{4}$	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{9}$
Ni-63	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{9}$
Ni-65	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ni-66	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Copper				
Cu-60	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Cu-61	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Cu-64	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Cu-67	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Zinc				
Zn-62	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Zn-63	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Zn-65	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Zn-69	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Zn-69m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Zn-71m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Zn-72	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Gallium				
Ga-65	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ga-66	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Ga-67	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ga-68	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ga-70	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Ga-72	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Ga-73	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Germanium				
Ge-66	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ge-67	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ge-68+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Ge-69	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ge-71	$1\ 10^{4}$	$1\ 10^{8}$	$1\ 10^{13}$	$1\ 10^{9}$
Ge-75	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$

Ge-77	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Ge-78	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Arsenic				
As-69	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
As-70	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
As-71	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
As-72	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
As-73	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
As-74	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
As-76	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
As-77	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
As-78	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Selenium				
Se-70	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Se-73	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Se-73m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Se-75	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Se-79	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Se-81	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Se-81m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Se-83	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Bromine				
Br-74	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Br-74m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Br-75	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Br-76	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Br-77	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Br-80	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Br-80m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Br-82	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Br-83	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Br-84	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$

Krypton				
Kr-74	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Kr-76	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{10}$	
Kr-77	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Kr-79	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{10}$	
Kr-81	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	
Kr-81m	$1\ 10^{3}$	$1\ 10^{10}$	$1\ 10^{10}$	
Kr-83m	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{12}$	
Kr-85	$1\ 10^{5}$	$1\ 10^{4}$	$1\ 10^{12}$	
Kr-85m	$1\ 10^{3}$	$1\ 10^{10}$	$1\ 10^{10}$	
Kr-87	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Kr-88	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Rubidium				
Rb-79	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Rb-81	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Rb-81m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{15}$	$1\ 10^{8}$
Rb-82m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Rb-83+	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Rb-84	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Rb-86	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Rb-87	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Rb-88	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Rb-89	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Strontium				
Sr-80	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Sr-81	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Sr-82+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Sr-83	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Sr-85	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Sr-85m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Sr-87m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Sr-89	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Sr-90+	$1\ 10^{2}$	$1\ 10^{4}$	$1\ 10^{9}$	$1\ 10^{5}$
Sr-91	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$

Sr-92	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Yttrium				
Y-86	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Y-86m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Y-87+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Y-88	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Y-90	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Y-90m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Y-91	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Y-91m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Y-92	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Y-93	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Y-94	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Y-95	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Zirconium				
Zr-86	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Zr-88	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Zr-89	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Zr-93+	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{9}$	$1\ 10^{8}$
Zr-95	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Zr-97+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Niobium				
Nb-88	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Nb-89 (2.03 hours)	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Nb-89 (1.01 hour)	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Nb-90	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Nb-93m	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Nb-94	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Nb-95	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Nb-95m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Nb-96	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Nb-97	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$

Nb-98	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Molybdenum				
Mo-90	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Mo-93	$1\ 10^{3}$	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{9}$
Mo-93m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Mo-99	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Mo-101	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Technetium				
Tc-93	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tc-93m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Tc-94	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tc-94m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Tc-95	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tc-95m+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tc-96	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tc-96m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Tc-97	$1\ 10^{3}$	$1\ 10^{8}$	$1\ 10^{12}$	$1\ 10^{9}$
Tc-97m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Tc-98	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Tc-99	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Tc-99m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Tc-101	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Tc-104	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ruthenium				
Ru-94	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ru-97	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Ru-103	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ru-105	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ru-106+	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{9}$	$1\ 10^{6}$
Rhodium				
Rh-99	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Rh-99m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$

Rh-100	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Rh-101	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Rh-101m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Rh-102	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Rh-102m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Rh-103m	$1\ 10^{4}$	$1\ 10^{8}$	$1\ 10^{15}$	$1\ 10^{9}$
Rh-105	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Rh-106m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Rh-107	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Palladium				
Pd-100	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Pd-101	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pd-103	$1\ 10^{3}$	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{9}$
Pd-107	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{9}$
Pd-109	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Silver				
Ag-102	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ag-103	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ag-104	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ag-104m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ag-105	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ag-106	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ag-106m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ag-108m+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ag-110m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ag-111	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ag-112	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Ag-115	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Cadmium				
Cd-104	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Cd-107	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Cd-109	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Cd-113	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$

Cd-113m	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Cd-115	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Cd-115m	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Cd-117	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Cd-117m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Indium				
In-109	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
In-110 (4.9 hours)	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
In-110 (69.1 min.)	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
In-111	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
In-112	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
In-113m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
In-114	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{15}$	$1\ 10^{6}$
In-114m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
In-115	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
In-115m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
In-116m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
In-117	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
In-117m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
In-119m	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Tin				
Sn-110	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Sn-111	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Sn-113	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Sn-117m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Sn-119m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Sn-121	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Sn-121m+	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Sn-123	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Sn-123m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Sn-125	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Sn-126+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Sn-127	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$

Sn-128	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Antimony				
Sb-115	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Sb-116	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Sb-116m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Sb-117	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Sb-118m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Sb-119	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Sb-120 (5.76 days)	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Sb-120 (15.89 min.)	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Sb-122	$1\ 10^{2}$	$1\ 10^{4}$	$1\ 10^{11}$	$1\ 10^{5}$
Sb-124	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Sb-124m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Sb-125	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Sb-126	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Sb-126m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Sb-127	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Sb-128 (9.01 hours)	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Sb-128 (10.4 min.)	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Sb-129	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Sb-130	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Sb-131	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Tellurium				
Te-116	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Te-121	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Te-121m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Te-123	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Te-123m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Te-125m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Te-127	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$

Te-127m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Te-129	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Te-129m	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Te-131	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Te-131m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Te-132	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Te-133	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Te-133m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Te-134	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Iodine				
I-120	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
I-120m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
I-121	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
I-123	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
I-124	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
I-125	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
I-126	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
I-128	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
I-129	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{9}$	$1\ 10^{6}$
I-130	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
I-131	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
I-132	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
I-132m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
I-133	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
I-134	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
I-135	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Xenon				
Xe-120	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{10}$	
Xe-121	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Xe-122+	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{11}$	
Xe-123	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Xe-125	$1\ 10^{3}$	$1\ 10^{9}$	$1\ 10^{10}$	
Xe-127	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{10}$	
Xe-129m	$1\ 10^{3}$	$1\ 10^{4}$	$1\ 10^{11}$	

Xe-131m	$1\ 10^{4}$	$1\ 10^{4}$	$1\ 10^{11}$	
Xe-133	$1\ 10^{3}$	$1\ 10^{4}$	$1\ 10^{11}$	
Xe-133m	$1\ 10^{3}$	$1\ 10^{4}$	$1\ 10^{11}$	
Xe-135	$1\ 10^{3}$	$1\ 10^{10}$	$1\ 10^{10}$	
Xe-135m	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{10}$	
Xe-138	$1\ 10^{2}$	$1\ 10^{9}$	$1\ 10^{9}$	
Caesium				
Cs-125	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{13}$	$1\ 10^{5}$
Cs-127	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Cs-129	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Cs-130	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Cs-131	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Cs-132	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Cs-134	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{10}$	$1\ 10^{5}$
Cs-134m	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Cs-135	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Cs-135m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Cs-136	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Cs-137+	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{10}$	$1\ 10^{5}$
Cs-138	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{13}$	$1\ 10^{5}$
Barium				
Ba-126	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Ba-128	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Ba-131	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ba-131m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{15}$	$1\ 10^{8}$
Ba-133	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ba-133m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ba-135m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ba-137m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{15}$	$1\ 10^{7}$
Ba-139	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ba-140+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Ba-141	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ba-142	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$

Lanthanum				
La-131	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
La-132	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
La-135	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
La-137	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
La-138	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
La-140	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
La-141	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
La-142	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
La-143	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Cerium				
Ce-134	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Ce-135	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ce-137	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Ce-137m	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ce-139	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ce-141	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Ce-143	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ce-144+	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{9}$	$1\ 10^{6}$
Praseodymium				
Pr-136	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Pr-137	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Pr-138m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pr-139	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Pr-142	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Pr-142m	$1\ 10^{7}$	$1\ 10^{9}$	$1\ 10^{15}$	$1\ 10^{10}$
Pr-143	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Pr-144	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Pr-145	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Pr-147	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Neodymium				
Nd-136	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Nd-138	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$

Nd-139	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Nd-139m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Nd-141	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Nd-147	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Nd-149	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Nd-151	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Promethium				
Pm-141	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Pm-143	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Pm-144	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Pm-145	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Pm-146	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Pm-147	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Pm-148	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Pm-148m+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Pm-149	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Pm-150	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Pm-151	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Samarium				
Sm-141	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Sm-141m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Sm-142	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Sm-145	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Sm-146	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{6}$
Sm-147	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Sm-151	$1\ 10^{4}$	$1\ 10^{8}$	$1\ 10^{10}$	$1\ 10^{9}$
Sm-153	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Sm-155	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Sm-156	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Europium				
Eu-145	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Eu-146	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Eu-147	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$

Eu-148	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Eu-149	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Eu-150 (34.2 years)	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Eu-150 (12.6 hours)	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Eu-152	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Eu-152m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Eu-154	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Eu-155	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Eu-156	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Eu-157	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Eu-158	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Gadolinium				
Gd-145	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Gd-146+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Gd-147	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Gd-148	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Gd-149	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Gd-151	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Gd-152	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Gd-153	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Gd-159	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Terbium				
Tb-147	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tb-149	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tb-150	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tb-151	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tb-153	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Tb-154	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tb-155	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Tb-156	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tb-156m (24.4 hours)	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Tb-156m (5	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$

hours)				
Tb-157	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Tb-158	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Tb-160	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Tb-161	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Dysprosium				
Dy-155	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Dy-157	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Dy-159	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Dy-165	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Dy-166	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Holmium				
Ho-155	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ho-157	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Ho-159	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Ho-161	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Ho-162	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Ho-162m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ho-164	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Ho-164m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Ho-166	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Ho-166m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Ho-167	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Erbium				
Er-161	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Er-165	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Er-169	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Er-171	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Er-172	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Thulium				
Tm-162	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$

Tm-166	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tm-167	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tm-170	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Tm-171	$1\ 10^{4}$	$1\ 10^{8}$	$1\ 10^{11}$	$1\ 10^{9}$
Tm-172	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tm-173	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tm-175	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ytterbium				
Yb-162	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Yb-166	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Yb-167	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Yb-169	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Yb-175	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Yb-177	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Yb-178	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Lutetium				
Lu-169	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Lu-170	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Lu-171	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Lu-172	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Lu-173	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Lu-174	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Lu-174m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Lu-176	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Lu-176m	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Lu-177	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Lu-177m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Lu-178	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{14}$	$1\ 10^{6}$
Lu-178m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Lu-179	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Hafnium				
Hf-170	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Hf-172+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$

Hf-173	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Hf-175	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Hf-177m	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Hf-178m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{8}$	$1\ 10^{7}$
Hf-179m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Hf-180m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Hf-181	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Hf-182	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{8}$	$1\ 10^{7}$
Hf-182m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Hf-183	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Hf-184	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tantalum				
Ta-172	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ta-173	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ta-174	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ta-175	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ta-176	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ta-177	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Ta-178	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ta-179	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Ta-180	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ta-180m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Ta-182	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{10}$	$1\ 10^{5}$
Ta-182m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Ta-183	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ta-184	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ta-185	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ta-186	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Tungsten				
W-176	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
W-177	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
W-178+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
W-179	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
W-181	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$

W-185	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
W-187	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
W-188+	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Rhenium				
Re-177	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Re-178	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Re-181	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Re-182 (64 hours)	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Re-182 (12.7 hours)	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Re-184	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Re-184m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Re-186	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Re-186m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Re-187	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{13}$	$1\ 10^{10}$
Re-188	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Re-188m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Re-189+	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Osmium				
Os-180	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Os-181	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Os-182	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Os-185	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Os-189m	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Os-191	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Os-191m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Os-193	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Os-194+	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{9}$	$1\ 10^{6}$
Iridium				
Ir-182	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Ir-184	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ir-185	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ir-186 (15.8	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$

hours)				
Ir-186 (1.75 hours)	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ir-187	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Ir-188	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Ir-189+	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Ir-190	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ir-190m (3.1 hours)	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ir-190m (1.2 hours)	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{15}$	$1\ 10^{8}$
Ir-192	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{10}$	$1\ 10^{5}$
Ir-192m	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Ir-193m	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Ir-194	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Ir-194m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ir-195	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ir-195m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Platinum				
Pt-186	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Pt-188+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Pt-189	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pt-191	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Pt-193	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Pt-193m	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Pt-195m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Pt-197	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pt-197m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Pt-199	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Pt-200	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Gold				
Au-193	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Au-194	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Au-195	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$

Au-198	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Au-198m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Au-199	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Au-200	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Au-200m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Au-201	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Mercury				
Hg-193	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Hg-193m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Hg-194+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Hg-195	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Hg-195m+ (organic)	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Hg-195m+ (inorganic)	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Hg-197	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Hg-197m (organic)	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Hg-197m (inorganic)	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Hg-199m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Hg-203	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Thallium				
Tl-194	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Tl-194m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Tl-195	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Tl-197	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Tl-198	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tl-198m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Tl-199	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Tl-200	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tl-201	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Tl-202	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Tl-204	$1\ 10^{4}$	$1\ 10^{4}$	$1\ 10^{11}$	$1\ 10^{5}$

Lead				
Pb-195m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Pb-198	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Pb-199	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Pb-200	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pb-201	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pb-202	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Pb-202m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pb-203	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pb-205	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Pb-209	$1\ 10^{5}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Pb-210+	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{8}$	$1\ 10^{5}$
Pb-211	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pb-212+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Pb-214	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Bismuth				
Bi-200	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Bi-201	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Bi-202	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Bi-203	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Bi-205	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Bi-206	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Bi-207	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Bi-210	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Bi-210m+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
Bi-212+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{11}$	$1\ 10^{6}$
Bi-213	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Bi-214	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Polonium				
Po-203	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Po-205	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Po-206	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Po-207	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Po-208	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$

Po-209	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Po-210	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Astatine				
At-207	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
At-211	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Francium				
Fr-222	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{12}$	$1\ 10^{6}$
Fr-223	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Radon				
Rn-220+	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{8}$	$1\ 10^{8}$
Rn-222+	$1\ 10^{1}$	$1\ 10^{8}$	$1\ 10^{9}$	$1\ 10^{9}$
Radium				
Ra-223+	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{6}$
Ra-224+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
Ra-225	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{6}$
Ra-226+	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Ra-227	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Ra-228+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
Actinium				
Ac-224	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Ac-225+	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Ac-226	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
Ac-227+	$1\ 10^{-1}$	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{4}$
Ac-228	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Thorium				
Th-226+	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Th-227	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Th-228+	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Th-229+	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Th-230	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$

Th-231	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Th-232	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Th-232sec	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Th-234+	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{10}$	$1\ 10^{6}$
Protactinium				
Pa-227	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Pa-228	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Pa-230	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{8}$	$1\ 10^{7}$
Pa-231	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Pa-232	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Pa-233	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Pa-234	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Uranium				
U-230+	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{6}$
U-231	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
U-232+	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
U-233	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
U-234	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
U-235+	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
U-236	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
U-237	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
U-238+	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
U-238 sec	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
U-239	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
U-240	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
U-240+	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Neptunium				
Np-232	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Np-233	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Np-234	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Np-235	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Np-236 (1.15 10^{5} years)	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$

Np-236 (22.5 hours)	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Np-237+	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{4}$
Np-238	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Np-239	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Np-240	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Plutonium				
Pu-234	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Pu-235	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Pu-236	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Pu-237	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Pu-238	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Pu-239	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Pu-240	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Pu-241	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
Pu-242	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Pu-243	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{13}$	$1\ 10^{8}$
Pu-244	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Pu-245	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Pu-246	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Americium				
Am-237	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Am-238	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Am-239	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Am-240	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Am-241	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Am-242	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{10}$	$1\ 10^{7}$
Am-242m+	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Am-243+	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Am-244	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Am-244m	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{14}$	$1\ 10^{8}$
Am-245	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Am-246	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{13}$	$1\ 10^{6}$
Am-246m	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$

Curium				
Cm-238	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Cm-240	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{6}$
Cm-241	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Cm-242	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{6}$
Cm-243	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Cm-244	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Cm-245	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Cm-246	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Cm-247	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Cm-248	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Cm-249	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{14}$	$1\ 10^{7}$
Cm-250	$1\ 10^{-1}$	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{4}$
Berkelium				
Bk-245	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Bk-246	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{11}$	$1\ 10^{7}$
Bk-247	$1\ 10^{0}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Bk-249	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Bk-250	$1\ 10^{1}$	$1\ 10^{6}$	$1\ 10^{12}$	$1\ 10^{7}$
Californium				
Cf-244	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{12}$	$1\ 10^{8}$
Cf-246	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Cf-248	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Cf-249	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Cf-250	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{6}$	$1\ 10^{5}$
Cf-251	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{4}$
Cf-252	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Cf-253	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
Cf-254	$1\ 10^{0}$	$1\ 10^{3}$	$1\ 10^{7}$	$1\ 10^{4}$
Einsteinium				
Es-250	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{13}$	$1\ 10^{7}$
Es-251	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$

Es-253	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{8}$	$1\ 10^{6}$
Es-254	$1\ 10^{1}$	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{5}$
Es-254m	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Fermium				
Fm-252	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Fm-253	$1\ 10^{2}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Fm-254	$1\ 10^{4}$	$1\ 10^{7}$	$1\ 10^{10}$	$1\ 10^{8}$
Fm-255	$1\ 10^{3}$	$1\ 10^{6}$	$1\ 10^{9}$	$1\ 10^{7}$
Fm-257	$1\ 10^{1}$	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{6}$
Mendelevium				
Md-257	$1\ 10^{2}$	$1\ 10^{7}$	$1\ 10^{11}$	$1\ 10^{8}$
Md-258	$1\ 10^{2}$	$1\ 10^{5}$	$1\ 10^{7}$	$1\ 10^{6}$
Other radionuclides not listed above (see note 1)	$1\ 10^{-1}$	$1\ 10^{3}$	$1\ 10^{5}$	$1\ 10^{4}$

Note 1
In the case of radionuclides not specified elsewhere in this Part, the quantities specified in this entry are to be used unless the competent authority has approved some other quantity for that radionuclide.

Note 2
Nuclides carrying the suffix '+' or 'sec' in the above Table represent parent nuclides in equilibrium with their correspondent daughter nuclides as listed in the following Table. In this case the concentrations and quantities given in the above Table refer to the parent nuclide alone, but already take account of the daughter nuclide(s) present.

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PART II

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Quantity Ratios for more than one radionuclide

1. For the purpose of Regulation 2(4), the quantity ratio for more than one radionuclide is the sum of the quotients of the quantity of a radionuclide present "Q_p" divided by the quantity of that radionuclide specified in the appropriate column of Part I of this Schedule "Q_{lim}", namely-

$$\sum \frac{Q_p}{Q_{lim}}$$

2. In any case where the isotopic composition of a radioactive substance is not known or is only partially known, the quantity ratio for that substance shall be calculated by using the values specified in the appropriate column in Part I for 'other radionuclides not listed above for any radionuclide that has not been identified or where the quantity of a radionuclide is uncertain, unless the employer can show that the use of some other value is appropriate in the circumstances of a particular case, when he may use that value.

SCHEDULE 9

This schedule reproduces Annex I of Council Directive 2003/122/EURATOM of 22 December 2003 on the control of high-activity sealed radioactive sources and orphan sources.

ANNEX I
Activity levels

For radionuclides not listed in the table below, but referred to in Annex I, Table A, of Directive 96/29/Euratom, the relevant activity level is one hundredth of the corresponding A1 value given in the IAEA Regulations for the safe transport of radioactive materials (1).

Element (Atomic number)	*Radionuclide*	*Activity level (Bq)*
Iron (26)	Fe-55	4 × 1011
Cobalt (27)	Co-60	4 × 109
Selenium (34)	Se-75	3 × 1010
Krypton (36)	Kr-85	1 × 1011
Strontium (38)	Sr-90 (a)	3× 109
Palladium (46)	Pd-103 (a)	4× 1011
Iodine (53)	I-125	2 × 1011
Caesium (55)	Cs-137 (a)	2× 1010
Promethium (61)	Pm-147	4 × 1011
Gadolinium (64)	Gd-153	1 × 1011
Thulium (69)	Tm-170	3 × 1010
Iridium (77)	Ir-192	1 × 1010
Thallium (81)	Tl-204	1 × 1011
Radium (88)	Ra-226 (b)	2× 109
Plutonium (94)	Pu-238 (a)	1× 1011
Americium (95)	Am-241 (b)	1× 1011
Californium (98)	Cf-252	5 × 108

(a) The activity level includes contributions from daughter nuclides with half-lives less than 10 days.

(b) Includes neutron sources with beryllium.

(1) No TS-R-1 (ST-1, revised) — International Atomic Energy Agency, Vienna 2000.

SCHEDULE 10

This Schedule reproduces Article 3(2)(a) and Table A to Annex 1 of Directive 96/26/Euratom.

Article 3

2. No reporting need be required for practices involving the following:

(a) radioactive substances where the quantities involved do not exceed in total the exemption values set out in column 2 of Table A to Annex I or, in exceptional circumstances in an individual Member State, different values authorized by the competent authorities that nevertheless satisfy the basic general criteria set out in Annex I.

Table A

Nuclide	Quantity (Bq)	Concentration (kBq/kg)
H-3	10^9	10^6
Be-7	10^7	10^3
C-14	10^7	10^4
O-15	10^9	10^2
F-18	10^6	10
Na-22	10^6	10
Na-24	10^5	10
Si-31	10^6	10^3
P-32	10^5	10^3
P-33	10^8	10^5
S-35	10^8	10^5
Cl-36	10^6	10^4
Cl-38	10^5	10
Ar-37	10^8	10^6
Ar-41	10^9	10^2
K-40	10^6	10^2
K-42	10^6	10^2
K-43	10^6	10
Ca-45	10^7	10^4
Ca-47	10^6	10
Sc-46	10^6	10
Sc-47	10^6	10^2
Sc-48	10^5	10
V-48	10^5	10

Cr-51	10^7	10^3
Mn-51	10^5	10
Mn-52	10^5	10
Mn-52m	10^5	10
Mn-53	10^9	10^4
Mn-54	10^6	10
Mn-56	10^5	10
Fe-52	10^6	10
Fe-55	10^6	10^4
Fe-59	10^6	10
Co-55	10^6	10
Co-56	10^5	10
Co-57	10^6	10^2
Co-58	10^6	10
Co-58m	10^7	10^4
Co-60	10^5	10
Co-60m	10^6	10^3
Co-61	10^6	10^2
Co-62m	10^5	10
Ni-59	10^8	10^4
Ni-63	10^8	10^5
Ni-65	10^6	10
Cu-64	10^6	10^2
Zn-65	10^6	10
Zn-69	10^6	10^4
Zn-69m	10^6	10^2
Ga-72	10^5	10
Ge-71	10^8	10^4
As-73	10^7	10^3
As-74	10^6	10
As-76	10^5	10^2
As-77	10^6	10^3
Se-75	10^6	10^2
Br-82	10^6	10
Kr-74	10^9	10^2
Kr-76	10^9	10^2
Kr-77	10^9	10^2
Kr-79	10^5	10^3
Kr-81	10^7	10^4
Kr-83m	10^{12}	10^5
Kr-85	10^4	10^5
Kr-85m	10^{10}	10^3
Kr-87	10^9	10^2
Kr-88	10^9	10^2
Rb-86	10^5	10^2
Sr-85	10^6	10^2

Sr-85m	10^7	10^2
Sr-87m	10^6	10^2
Sr-89	10^6	10^3
Sr-90 +	10^4	10^2
Sr-91	10^5	10
Sr-92	10^6	10
Y-90	10^5	10^3
Y-91	10^6	10^3
Y-91m	10^6	10^2
Y-92	10^5	10^2
Y-93	10^5	10^2
Zr-93 +	10^7	10^3
Zr-95	10^6	10
Zr-97 +	10^5	10
Nb-93m	10^7	10^4
Nb-94	10^6	10
Nb-95	10^6	10
Nb-97	10^6	10
Nb-98	10^5	10
Mo-90	10^6	10
Mo-93	10^8	10^3
Mo-99	10^6	10^2
Mo-101	10^6	10
Tc-96	10^6	10
Tc-96m	10^7	10^3
Tc-97	10^8	10^3
Tc-97m	10^7	10^3
Tc-99	10^7	10^4
Tc-99m	10^7	10^2
Ru-97	10^7	10^2
Ru-103	10^6	10^2
Ru-105	10^6	10
Ru-106 +	10^5	10^2
Rh-103m	10^8	10^4
Rh-105	10^7	10^2
Pd-103	10^8	10^3
Pd-109	10^6	10^3
Ag-105	10^6	10^2
Ag-108m +	10^6	10
Ag-110m	10^6	10
Ag-111	10^6	10^3
Cd-109	10^6	10^4
Cd-115	10^6	10^2
Cd-115m	10^6	10^3
In-111	10^6	10^2
In-113m	10^6	10^2

In-114m	10^6	10^2
In-115m	10^6	10^2
Sn-113	10^7	10^3
Sn-125	10^5	10^2
Sb-122	10^4	10^2
Sb-124	10^6	10
Sb-125	10^6	10^2
Te-123m	10^7	10^2
Te-125m	10^7	10^3
Te-127	10^6	10^3
Te-127m	10^7	10^3
Te-129	10^6	10^2
Te-129m	10^6	10^3
Te-131	10^5	10^2
Te-131m	10^6	10
Te-132	10^7	10^2
Te-133	10^5	10
Te-133m	10^5	10
Te-134	10^6	10
I-123	10^7	10^2
I-125	10^6	10^3
I-126	10^6	10^2
I-129	10^5	10^2
I-130	10^6	10
I-131	10^6	10^2
I-132	10^5	10
I-133	10^6	10
I-134	10^5	10
I-135	10^6	10
Xe-131m	10^4	10^4
Xe-133	10^4	10^3
Xe-135	10^{10}	10^3
Cs-129	10^5	10^2
Cs-131	10^6	10^3
Cs-132	10^5	10
Cs-134m	10^5	10^3
Cs-134	10^4	10
Cs-135	10^7	10^4
Cs-136	10^5	10
Cs-137 +	10^4	10
Cs-138	10^4	10
Ba-131	10^6	10^2
Ba-140 +	10^5	10
La-140	10^5	10
Ce-139	10^6	10^2
Ce-141	10^7	10^2

Ce-143	10^6	10^2
Ce-144 +	10^5	10^2
Pr-142	10^5	10^2
Pr-143	10^6	10^4
Nd-147	10^6	10^2
Nd-149	10^6	10^2
Pm-147	10^7	10^4
Pm-149	10^6	10^3
Sm-151	10^8	10^4
Sm-153	10^6	10^2
Eu-152	10^6	10
Eu-152m	10^6	10^2
Eu-154	10^6	10
Eu-155	10^7	10^2
Gd-153	10^7	10^2
Gd-159	10^6	10^3
Tb-160	10^6	10
Dy-165	10^6	10^3
Dy-166	10^6	10^3
Ho-166	10^5	10^3
Er-169	10^7	10^4
Er-171	10^6	10^2
Tm-170	10^6	10^3
Tm-171	10^8	10^4
Yb-175	10^7	10^3
Lu-177	10^7	10^3
Hf-181	10^6	10
Ta-182	10^4	10
W-181	10^7	10^3
W-185	10^7	10^4
W-187	10^6	10^2
Re-186	10^6	10^3
Re-188	10^5	10^2
Os-185	10^6	10
Os-191	10^7	10^2
Os-191m	10^7	10^3
Os-193	10^6	10^2
Ir-190	10^6	10
Ir-192	10^4	10
Ir-194	10^5	10^2
Pt-191	10^6	10^2
Pt-193m	10^7	10^3
Pt-197	10^6	10^3
Pt-197m	10^6	10^2
Au-198	10^6	10^2
Au-199	10^6	10^2

Hg-197	10^7	10^2
Hg-197m	10^6	10^2
Hg-203	10^5	10^2
Tl-200	10^6	10
Tl-201	10^6	10^2
Tl-202	10^6	10^2
Tl-204	10^4	10^4
Pb-203	10^6	10^2
Pb-210+	10^4	10
Pb-212+	10^5	10
Bi-206	10^5	10
Bi-207	10^6	10
Bi-210	10^6	10^3
Bi-212+	10^5	10
Po-203	10^6	10
Po-205	10^6	10
Po-207	10^6	10
Po-210	10^4	10
At-211	10^7	10^3
Rn-220+	10^7	10^4
Rn-222+	10^8	10
Ra-223+	10^5	10^2
Ra-224+	10^5	10
Ra-225	10^5	10^2
Ra-226+	10^4	10
Ra-227	10^6	10^2
Ra-228+	10^5	10
Ac-228	10^6	10
Th-226+	10^7	10^3
Th-227	10^4	10
Th-228+	10^4	1
Th-229+	10^3	1
Th-230	10^4	1
Th-231	10^7	10^3
Th-232sec	10^3	1
Th-234+	10^5	10^3
Pa-230	10^6	10
Pa-231	10^3	1
Pa-233	10^7	10^2
U-230+	10^5	10
U-231	10^7	10^2
U-232+	10^3	1
U-233	10^4	10
U-234	10^4	10
U-235+	10^4	10
U-236	10^4	10

U-237	10^6	10^2
U-238+	10^4	10
U-238sec	10^3	1
U-239	10^6	10^2
U-240	10^7	10^3
U-240+	10^6	10
Np-237+	10^3	1
Np-239	10^7	10^2
Np-240	10^6	10
Pu-234	10^7	10^2
Pu-235	10^7	10^2
Pu-236	10^4	10
Pu-237	10^7	10^3
Pu-238	10^4	1
Pu-239	10^4	1
Pu-240	10^3	1
Pu-241	10^5	10^2
Pu-242	10^4	1
Pu-243	10^7	10^3
Pu-244	10^4	1
Am-241	10^4	1
Am-242	10^6	10^3
Am-242m+	10^4	1
Am-243+	10^3	1
Cm-242	10^5	10^2
Cm-243	10^4	1
Cm-244	10^4	10
Cm-245	10^3	1
Cm-246	10^3	1
Cm-247	10^4	1
Cm-248	10^3	1
Bk-249	10^6	10^3
Cf-246	10^6	10^3
Cf-248	10^4	10
Cf-249	10^3	1
Cf-250	10^4	10
Cf-251	10^3	1
Cf-252	10^4	10
Cf-253	10^5	10^2
Cf-254	10^3	1
Es-253	10^5	10^2
Es-254	10^4	10
Es-254m	10^6	10^2
Fm-254	10^7	10^4
Fm-255	10^6	10^3

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