

Contents

Preface	iii
1. Introduction	1
1.1 Need for Recommendations	1
1.2 Structure of the Report	2
1.3 Formalism and Physical Data	2
1.4 Limitations in Scope of Report	2
1.5 Applications of the Report	2
2. Physical Concepts and Basic Formulae	4
2.1 Introduction: The Necessity for Absorbed-Dose Calculations	4
2.2 Basic Concepts	4
2.3 Assumptions and Notation	6
2.4 Formulae	6
2.4.1 Absorbed Dose Under Equilibrium Conditions	6
2.4.2 Absorbed Fraction and Specific Absorbed Fraction	6
2.4.3 Reciprocity Theorem	7
2.4.4 Absorbed-Dose Equations	8
2.4.5 Conversion from Absorbed-Dose to Absorbed-Dose-Rate Equations	8
2.4.6 Time Dependence of Source Activity	8
2.4.7 Conversion of Units	9
2.4.8 Penetrating and Nonpenetrating Radiations	9
2.4.9 The Density Transformation Rule	10
2.5 Relationship of Recommended to Earlier Methods of Absorbed-Dose Calculation	11
3. Biological Aspects of Dosimetry	14
3.1 Distribution of Activity in the Body Following Administration of Radiopharmaceuticals	14
3.1.1 Observations on Animals	14
3.1.2 Distribution of Stable Elements or Compounds in Humans	15
3.1.3 Investigations on Human Subjects	16
3.2 Organs and Tissues	21
3.2.1 Data on Organ Mass, Size, Composition, and Spatial Distribution in Man	21
3.2.2 Mass of Tissue in Disease States	22
3.3 Reporting of Results	22
3.4 Sources of Biological Data	22
4. Summary of Procedures Used in Estimating Absorbed Dose	23
4.1 Assumptions	23
4.2 Sources of Data	23
4.2.1 Mean Energy of i^{th} Type Per Nuclear Transformation of the Parent Element, Δ_i	23

4.2.2 Absorbed Fraction, ϕ	23
4.2.3 Time Integral of Activity, \tilde{A}	23
4.2.4 Mass of Target Organ, m	23
4.3 Other Parameters	23
4.4 Examples	23
5. Problems and Recommendations	25
5.1 Simplification of Data	25
5.2 Methods of Tabulation	25
5.3 Reporting of Absorbed-Dose Estimates	25
5.4 Accuracy of Biological Data	25
5.5 Securing Human Biological Data	25
APPENDIX A. Sources of Physical Data Concerning Radionuclides	26
APPENDIX B. Absorbed Fractions and Specific Absorbed Fractions for Photons	33
APPENDIX C. Examples of Absorbed-Dose Calculations	39
APPENDIX D. Dosimetry of Auger Electrons and Other Low Energy Radiations	47
APPENDIX E. Sources of Biological Data	52
References	53
ICRU Reports	59
Index	61