

Radiochemistry

PROFESSOR
IGOR N. BECKMAN

RADIATION AND
NUCLEAR MEDICINE:
physical and chemical aspects



I.N.Beckman

**RADIATION AND NUCLEAR MEDICINE:
PHYSICAL AND CHEMICAL ASPECTS**

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A text-book series in Postgraduate Education

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Abstract

“Radiation and nuclear medicine: physical and chemical aspects” is the 7th volume in popular *“Radiochemistry”* text-book series, authored by prof. I. Beckman. This volume is dedicated to clinical applications of ionizing radiation and radionuclides. The author describes their usage in modern diagnostics, surgery and therapy and provides numerous practical examples to the reader. **Part I** describes the phenomenon of radioactivity, nuclear reactions, interactions of ionizing radiation with matter and biological effects of radiation. Current national and international radiation safety guidelines and sanitary standards are provided. **Part II** of the text-book is dedicated to methods of radiation diagnostics (planar X-ray imaging and CT scans) and therapy (X-ray-, γ -, and hadron therapy; radiosurgery, brachytherapy). **Part III** contains essential information on radionuclide diagnostics and therapy. The author describes the theoretical foundations, equipment and applications of scintigraphy, radioimmunoassays, single-photon emission computed tomography, positron emission tomography and kinetic methods. Methods and equipment for production of short-lived radioisotopes, as well as synthesis of radiopharmaceuticals are all outlined in the concluding chapters of present volume. The author reviews techniques which are currently employed in radiation and nuclear medicine as well as their applications in diagnostics and therapy of malignant tumors.

The volume has been written as an accompanying text-book for post-graduate students, taking advanced courses in chemistry and physics. However, it can be used a reference book by researchers working with radiation and by everyone who is interested in ionizing radiation, radioisotopes and their medical applications.

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Nuclear medicine procedures are used in diagnosing and treating certain illnesses. These procedures use radioactive materials called radiopharmaceuticals. Examples of diseases treated with nuclear medicine procedures are hyperthyroidism, thyroid cancer, lymphomas, and bone pain from some types of cancer. The amount of radioactive materials used in diagnosing illnesses depends on the needs of the person and range from a small amount to a large amount. Radioactive materials are chemicals that release radiation (energy). Radioactive materials can be natural or they can be man-made. They can be solids (like some rocks on earth) or liquids or they can also be gases that people can breathe (like radon).