**AMERICAN BOARD OF MEDICAL PHYSICS, INC.**

**STUDY GUIDE 2010**

**"Part II - Medical Health Physics"**

**TOPICS FOR EXAMINATION**

 We seek to determine the candidate's practical experience as well as his/her understanding of current radiation protection standards.  In  Parts II we test the candidate's level of knowledge on 9 topics:

**Content Categories**

|  |  |  |
| --- | --- | --- |
| I. | Instrumentation | 10% |
| II. | Laboratory Design | 5% |
| III. | Standards and Regulations | 15% |
| IV. | Radiation Oncology - Including brachytherapy | 15% |
| V. | Structural Shielding Design | 15% |
| VI. | Imaging-Quality Assurance - Including Nuclear Medicine | 20% |
| VII. | Radiobiology | 5% |
| VIII. | Radiopharmaceutical Therapy | 10% |
| IX. | Non-Ionizing Radiation | 5% |

**Subjects Covered**

Instrumentation

       Characteristics and limitations of Portable ionization chambers

       Geiger-Muller counters

       Scintillation counters

      Liquid Scintillation counting systems

      Multi-channel analyzers

      Gamma counting systems

      Uses of instrumentation in the field and in emergency situations

Laboratory Design

            Ventilation systems

            Hood design

            Contamination control

Standards and Regulations

            Risk Estimates

            Radiobiological basis for permissible doses

            Permissible Doses

            Familiarity with Regulatory Codes

            Familiarity with NRC/NCRP Guidelines

Radiation Oncology/Brachytherapy Quality Assurance

            Elements of Quality Management Program

            JCAHO Requirements

            Inventory Control-Brachytherapy

            Exposure Control

            Medical Events.

            Incident Investigation

            Quality Control Testing

Structural Shielding Design

            Diagnostic Installations

            Accelerator Shielding and Upgrades

            Neutron Protection

            Sealed Source Protection

Imaging-Quality Assurance

            FDA Regulations

            Elements of Quality Management Program

            JCAHO Requirements

            Quality Control Testing

Radiobiology

            BEIR Reports

            NCRP Recommendations

Radiopharmaceutical Therapy

            I-131 Therapy

·             Typical Doses

·             Exposure Control

·             Contamination Control

·             Release Criteria

Radioimmunotherapy

Non-Ionizing Radiation

            Laser Safety Standards

MRI Design and Hazard

**Reference Study Material**

The following text provides a listing of books or reports that are intended to assist persons preparing for the examination.  This list is not all-inclusive.

A basic understanding of medical physics practices is necessary in addition to standard health physics practices and principles.  An understanding of diagnostic radiology to the level of S. Bushong, *Radiological Science for Technologist*, (latest edition Mosby-Year Book, St. Louis) is needed.

For radiation therapy, a level midway between say *Applied Physics for Radiation Oncology*, (R. Stanton and I. Stinson, Med. Physics. Pub., Madison, 1996) and The *Physics of Radiation Therapy* ( F. Kahn ,Second Edition, Williams & Wilkens, Baltimore) is desirable.  For nuclear medicine, the text Physics *in Nuclear Medicine*, J. Sorenson and M. Phelps, Gruine and Stratton, latest edition is helpful.

Other texts of interest are :

*Hospital Health Physics,* Proceedings of the 1993 HPS Summer School, Eds., G.G. Eichholz & J.J. Shanka.

*Radiation Instruments*, Ed., H.Cember, Health Physics Summer School, 2001.

*Shielding Techniques,* P. McGinley*,* Second Edition*,* Med. Physics Pub., 2002.

US Nuclear Regulatory Commission

Title 10, Parts 20 and 35

Regulatory Guides, including 8.39

Licensing Guide for Medical Licenses of Broad Scope

Licensing Guide for Specific Scope Licenses

American Association of Physicists in Medicine

Report of Task Group 40

Report of Task Group 53

National Council on Radiation Protection and Measurements:

Report No. 37, “Precautions in the Management of Patients Who Have Received Therapeutic Amounts of Radionuclides”

Report No. 49, “Structural Shielding Design and Evaluation for Medical Use of X Rays and Gamma Rays Up to 10 MeV”

Report No. 54, “Medical Radiation Exposure of Pregnant and Potentially Pregnant Women”

Report No. 65, “Management of Persons Accidentally Contaminated with Radionuclides”

Report No. 79, “Neutron Contamination from Medical Electron Accelerators”

Report No. 102, “Medical X-Ray, Electron Beam and Gamma-Ray Protection for Energies Up to 50 MeV”

Report No. 115, “Risk Estimates for Radiation Protection”

Report No. 116, “Limitation of Exposure to Ionizing Radiation”

Report No. 119, " A Practical Guide to the Determination of Human Exposure to Radiofrequency Fields" (1993).

Report No. 122, "Use of Personal Monitors to Estimate Effective Dose Equivalent and Effective Dose to Workers For External Exposure to Low-LET Radiation" (1995)

Report No. 127, “Operational Radiation Safety Program”

Report No. 124, "Sources and Magnitude of Occupational and Public Exposures from Nuclear Medicine Procedures" (1996)

Report No. 125, "Deposition, Retention and Dosimetry of Inhaled Radioactive Substances" (1997)

Report No. 126, "Uncertainties in Fatal Cancer Risk Estimates Used in Radiation Protection" (1997)

Report No. 128, "Radionuclide Exposure of the Embryo/Fetus" (1998)

Report No. 133, "Radiation Protection for Procedures Performed Outside the Radiology Department" (2000)

Report No. 134, "Operational Radiation Safety Training" (2000)

Report No. 136, "Evaluation of the Linear-Nonthreshold Dose-Response Model for Ionizing Radiation" (2001)

Report No. 140, "Exposure Criteria for Medical Diagnostic Ultrasound" (2002)

Report No. 144, "Radiation Protection for Particle Accelerator Facilities" (2003)

Report No. 145, "Radiation Protection in Dentistry" (2003)

Report No. 147, "Structural Shielding Design for Medical X-Ray Imaging Facilities" (2004)

Report No. 149, "A Guide to Mammography and Other Breast Imaging Procedures" (2004)

Report No.151, " Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-Ray Radiotherapy Facilities" (2005).

OTHER REFERENCES

Blater S. "Interventional Fluoroscopy: Physics, Technology & Safety", Wiley-Liss, 2001.

Bushong, S.C. "Radiologic Science For Technologists," 3rd Ed., Mosby, ST. Louis, 1984.

Cember H. "Introduction to Health Physics", 3rd Edition. McGraw-Hill, 1996.

Dendy PP & Heaton B. "Physics for Diagnostic Radiology", 2nd Edition. Insitute of Physics, 1999.

Johns, H.E. and Cunningham, J.R. "The Physics of Radiology," 4th Ed., Thomas, Springfield, 1983.

Khan, F.M. "The Physics of Radiation Therapy," 3rd Edition. Lippincott Williams and Wilkins, 2003.

Tsoulfanaids N. "Measurement and Detection of Radiation", 2nd Edition, Taylor & Francis, 1995.

Turner, J.E. "Atoms, Radiation and Radiation Protection", 2nd Edition. John Wiley & Sons, 1995.

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**STUDY GUIDE 2010**

**"Part III - Medical Health Physics"**

**TOPICS FOR ORAL EXAMINATION**

The oral examination is conducted by a multi-member examination panel and is designed to determine the candidate's knowledge and fitness to practice in a clinical environment.  In general, questions will seek to determine the candidate's practical experience as well as his/her understanding of current radiation protection standards.  Whereas through Parts I and II we test the candidate's level of knowledge, the goal of this examination is to determine whether this knowledge can be applied correctly and effectively in a hospital setting.

During the oral examination the candidate will be asked by the panel members to demonstrate understanding of the following 9 topics:

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      Uses of instrumentation in the field and in emergency situations

Laboratory Design

       Ventilation systems

       Hood design

       Contamination control

Standards and Regulations

       Risk Estimates

       Radiobiological basis for permissible doses

       Permissible Doses

       Familiarity with Regulatory Codes

       Familiarity with NRC/NCRP Guidelines

Radiation Oncology/Brachytherapy Quality Assurance

       Elements of Quality Management Program

       JCAHO Requirements

       Inventory Control-Brachytherapy

       Exposure Control

       Misadministrations

       Incident Investigation

       Quality Control Testing

Structural Shielding Design

       Diagnostic Installations

       Accelerator Shielding and Upgrades

       Neutron Protection

       Sealed Source Protection

Imaging-Quality Assurance

       FDA Regulations

       Elements of Quality Management Program

       JCAHO Requirements

       Quality Control Testing

Radiobiology

       BEIR Reports

       NCRP Recommendations

Radiopharmaceutical Therapy

       I-131 Therapy:

* Typical Doses
* Exposure Control
* Contamination Control
* Release Criteria
* Radioimmunotherapy

Non-Ionizing Radiation

       Laser Safety Standards

MRI Design and Hazard

**Reference Study Material**

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Report No. 127, “Operational Radiation Safety Program”

**Sample Questions**

1.  What elements would you present in a plan to deal with a teletherapy Co-60 source or HDR source (your choice) that will not automatically retract and continues to irradiate a patient.

2.    What specification would you require from (a) the architect and (b) the linear accelerator manufacture before beginning a therapy shielding design.

3.    A radiation worker 3 months pregnant is given a lumbar spine series. You are asked to calculate fetal dose.  What facts would you like to know from the Radiology Department before beginning your calculations? How would you communicate your results?

Note 1: You should make an effort to see as many different QC procedures as practical in various areas.  You are responsible for expert knowledge in all medical radiation safety areas regardless of your past and present employment.

**Note 2:  If you have not done so before, it is worthwhile to borrow a blueprint of a diagnostic room and a therapy vault and calculate the shielding requirements**.