Preparing for Part 1
ABR Diagnostic Physics Exam

Samantha J. Simiele, M.S.

University of Wisconsin Medical Radiation Research Center

57th Annual Meeting of the American Association of Physicists in Medicine
Anaheim, CA
July 12-16, 2015

Outline

- Overview
  - Eligibility
  - Registration and fees
- Exam
  - Format
  - Structure
  - Content
  - Study material
- Results
  - Statistics
  - Possible outcomes

Eligibility

- Must be enrolled in and in good standing, or have graduated from a CAMPEP-accredited:
  - Graduate program
  - DMP program
  - Certificate program
  - Medical physics residency
- Part 1 is the same for all applicants
  - Therapeutic
  - Diagnostic
  - Nuclear medicine

Registration and fees

- Timeline[1]
  - July 1st – registration opens
  - October 31st – registration deadline
  - November 30th – applicants notified of eligibility
  - August – exam administered
- Paperwork
  - Two copies of registration form
  - Registration fee ($505)
  - Program attestation form or transcripts
- Cancellation fees
  - Cancellation before exam: $300
  - No-show fee: $500

Outline

- Overview
  - Eligibility
  - Registration and fees
- Exam
  - Format
  - Structure
  - Content
  - Study material
- Results
  - Statistics
  - Possible outcomes

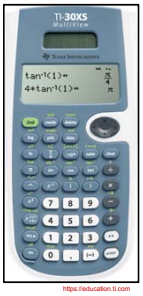
Exam format

- Offered by Pearson VUE[2]
  - Administered at an approved location
  - Register for location early
- Computer-based, multiple choice exam
- Tutorial and practice exam available online[3]
  - Windows-based PC is required
  - Mac OS is not supported
- Atmosphere is identical to GRE
  - Cameras, cubicles, moderator
  - Nothing should be brought into the room
    - Photo ID
    - Lockers to store other items
  - Dry erase boards

http://www.unionps.org

Information provided

- Calculator (TI-30XS) is available on the computer screen[4]
  - Become familiar with calculator before exam
  - Pearson VUE testing interface
- Constants[4]
  - Constants and physical values
  - Half-life of common radionuclides
  - ICRP tissue weighting factors
  - PET dose rate constants
  - Radiation weighting factors
  - IAEA dose rate constants and TVLs



https://education.ti.com

Exam structure

- Two parts: General and Clinical[5]
  - General component (237 minutes)
    - 80 total questions
    - 27 complex and 53 simple questions
  - Optional 30 minute break
  - Clinical component (90 minutes)
    - 75 total questions, all simple
- Total length: approximately 6.5 hours
- No penalty for guessing
- Questions do not have to be answered in order

Problem solving

- Typical test taking strategies:
  - Read the entire question
  - Look for key words: Always, Never, All, Except
  - Be mindful of units
  - Eliminate unreasonable answers
- Check all work – you will have time!

Content

Part 1: General[6]

- Nature and sources of radiation
- Radioactivity
- Basic atomic and nuclear physics
- Ultrasound
- Nuclear magnetic resonance
- Interactions of radiation with matter
- Spatial distribution and transmission of radiation
- Concepts of dosimetry
- Instrumentation and measurement techniques
- Principles of safety
- Methods of quality control and quality assurance
- Radiation protection
- Radiobiology
- Mathematics relevant to medical physics
- Statistics

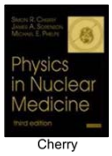
Part 1: Clinical

- Anatomy & Physiology
- Biochemistry
- Radiation effects
- Medical uses of radiation sources
- Radiochemistry
- Medical terminology

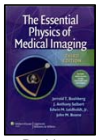
Study material

General

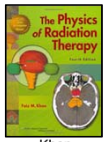
1. Essential Physics of Medical Imaging
2. The Physics of Radiation Therapy
3. Introduction to Radiological Physics and Dosimetry
4. Health Physics
5. Radiation detection and measurement
6. Physics in Nuclear Medicine



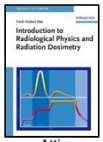
Cherry



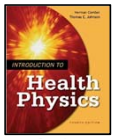
Bushberg



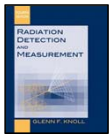
Khan



Attix



Cember

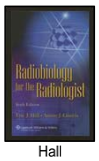


Knoll

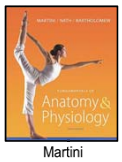
Study material

Clinical

- Radiobiology for the Radiologist
- Anatomy or physiology course notes



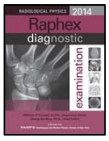
Hall

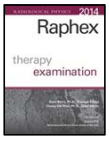


Martini

Other resources

- Raphex exams
- Graduate course notes
- Friends & colleagues



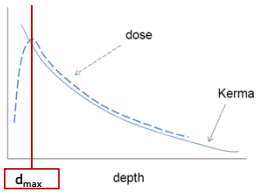


Example "simple" question

- Overview
- Exam
- Outcome

Beyond the depth of maximum dose, what is the relative behavior of dose and kerma?

a) Dose and kerma fall off equally
b) Kerma falls off faster than dose
c) Dose falls off faster than kerma
d) Dose falls while kerma rises
e) Dose rises while kerma falls



16

Example "complex" question

- Overview
- Exam
- Outcome

The mass attenuation coefficient of bone (density of 1.8 g/cm^3) is 0.2 cm^2/g for an 80-keV gamma ray. What percentage of 80-keV photons is attenuated by a slab of bone 4 cm thick under conditions of narrow beam geometry?[7]

a) 36%
b) 45%
c) 55%
d) 64%
e) 76%

$$I = I_0 e^{-\frac{\mu}{\rho}\rho x} \longrightarrow \frac{I}{I_0} = e^{-\frac{\mu}{\rho}\rho x}$$

$$\frac{I}{I_0} = e^{-\left(0.2\frac{cm^2}{g}\right)\left(1.8\frac{g}{cm^3}\right)(4cm)} = 0.24$$

$$1 - \frac{I}{I_0} = 1 - 0.24 = 0.76$$

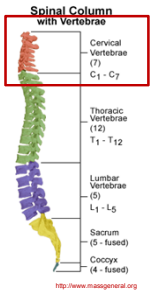
17

Example "simple" question

- Overview
- Exam
- Outcome

The human typically has how many cervical vertebrae?

a) 12 ⟵ Thoracic
b) 10
c) 7
d) 5 ⟵ Lumbar/Sacrum
e) 4 ⟵ Coccyx



18

Preparation

- Overview
- Exam
- Outcome

- Lot of material
- Review the exam topics early
  - Identify weaknesses
    - Courses you haven't taken for a while or haven't yet taken
    - Material that you have found confusing
  - Identify strengths
    - Wait until 1-2 weeks ahead of time to review
- Know what study habits work for you
  - Individual vs. group
- Don't get too caught up on any one topic
  - Only a few questions per topic
  - Breadth not depth

19

Outline

- Overview
- Exam
- Outcome

- Overview
  - Eligibility
  - Registration and fees
- Exam
  - Format
  - Structure
  - Content
  - Study material
- Results
  - Statistics
  - Possible outcomes

20

Statistics

- Overview
- Exam
- Outcome

General

First Time Takers Enrolled in a CAMPEP Program

Exam	% Fail	% Pass	Total
2010	13%	87%	55
2011	12%	88%	203
2012	8%	92%	251
2013	14%	86%	384
2014	30%	70%	152

Clinical

First Time Takers Enrolled in a CAMPEP Program

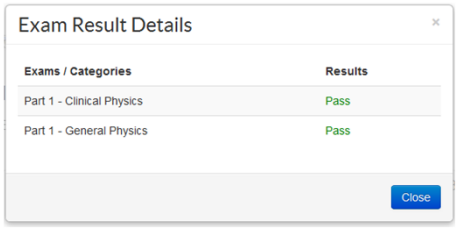
Exam	% Fail	% Pass	Total
2010	13%	87%	46
2011	10%	90%	159
2012	14%	86%	229
2013	23%	77%	379
2014	25%	75%	151

21

Results

- Overview
- Exam
- Outcome

- Results are available on myABR ~ 3 weeks following the exam date



22

Outcomes

- Overview
- Exam
- Outcome

- Pass both general and clinical sections
  - Move on to Part 2 or complete remainder of requirements necessary to take part 2
- Pass general section, but fail clinical section
  - Repeat clinical section
- Fail general section, but pass clinical section
  - Must repeat both sections
- Fail both parts
  - Must repeat both sections

23

Keep in mind

- Overview
- Exam
- Outcome

- Must pass Part 1 within 5 years of being approved to take Part 1
- Must be approved for Part 2 within 10 years after passing Part 1

- Lot of topics covered
- Think breadth not depth while studying
- ABR wants to know if you know the basic concepts

- **Good luck!**

24

Thank you

25

Helpful links

ABR Medical Physics: http://www.theabr.org/ic-rp-landing

1. Registration timeline: http://www.theabr.org/ic-rp-process
2. Pearson VUE: http://www.pearsonvue.com/ABR/
3. Tutorial: http://www.pearsonvue.com/athena/athena.asp
4. Calculator & Constants: http://www.theabr.org/ic-rp-calc
5. Exam length and question types: http://www.theabr.org/ic-rp-req
6. Test categories: http://www.theabr.org/ic-mp-study-guide
7. Sample questions: http://www.theabr.org/ic-rp-sample

26