A Glimpse Behind the Curtains: Exam Question Development

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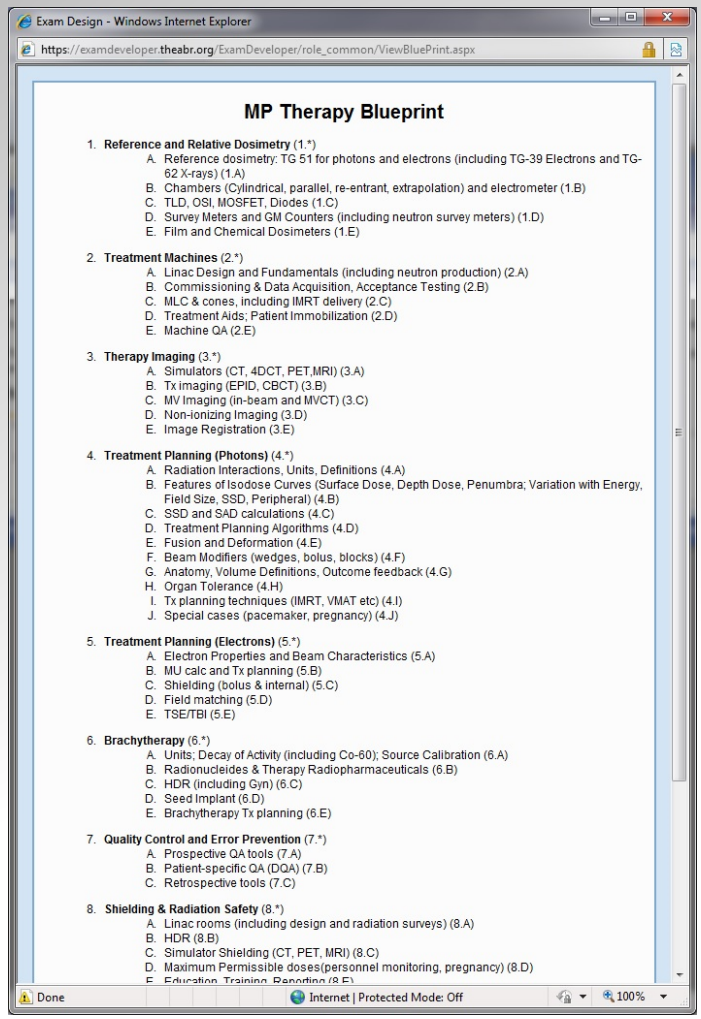
Timeline

- January - March:
  - Assess # of existing questions per category
  - Identify areas of need
  - Assign question writers to topics
- April - May:
  - Official question writing period
- June - August:
  - Question review and edit (several web-based sessions)
- August - September:
  - ABR staff final question edit (figures, tables etc.)
- October:
  - Question selection

The Exam Blue Print


Exam Design - Windows Internet Explorer

https://examdeveloper.theabr.org/ExamDeveloper/role_common/ViewBluePrint.aspx

MP Therapy Blueprint

1. **Reference and Relative Dosimetry** (1.*)
   - A. Reference dosimetry: TG 51 for photons and electrons (including TG-39 Electrons and TG-62 X-rays) (1.A)
   - B. Chambers (Cylindrical, parallel, re-entrant, extrapolation) and electrometer (1.B)
   - C. TLD, OSI, MOSFET, Diodes (1.C)
   - D. Survey Meters and GM Counters (including neutron survey meters) (1.D)
   - E. Film and Chemical Dosimeters (1.E)
2. **Treatment Machines** (2.*)
   - A. Linac Design and Fundamentals (including neutron production) (2.A)
   - B. Commissioning & Data Acquisition, Acceptance Testing (2.B)
   - C. MLC & cones, including IMRT delivery (2.C)
   - D. Treatment Aids; Patient Immobilization (2.D)
   - E. Machine QA (2.E)
3. **Therapy Imaging** (3.*)
   - A. Simulators (CT, 4DCT, PET,MRI) (3.A)
   - B. Tx imaging (EPID, CBCT) (3.B)
   - C. MV Imaging (in-beam and MVCT) (3.C)
   - D. Non-ionizing Imaging (3.D)
   - E. Image Registration (3.E)
4. **Treatment Planning (Photons)** (4.*)
   - A. Radiation Interactions, Units, Definitions (4.A)
   - B. Features of Isodose Curves (Surface Dose, Depth Dose, Penumbra; Variation with Energy, Field Size, SSD, Peripheral) (4.B)
   - C. SSD and SAD calculations (4.C)
   - D. Treatment Planning Algorithms (4.D)
   - E. Fusion and Deformation (4.E)
   - F. Beam Modifiers (wedges, bolus, blocks) (4.F)
   - G. Anatomy, Volume Definitions, Outcome feedback (4.G)
   - H. Organ Tolerance (4.H)
   - I. Tx planning techniques (IMRT, VMAT etc) (4.I)
   - J. Special cases (pacemaker, pregnancy) (4.J)
5. **Treatment Planning (Electrons)** (5.*)
   - A. Electron Properties and Beam Characteristics (5.A)
   - B. MU calc and Tx planning (5.B)
   - C. Shielding (bolus & internal) (5.C)
   - D. Field matching (5.D)
   - E. TSE/TBI (5.E)
6. **Brachytherapy** (6.*)
   - A. Units; Decay of Activity (including Co-60); Source Calibration (6.A)
   - B. Radionucleides & Therapy Radiopharmaceuticals (6.B)
   - C. HDR (including Gyn) (6.C)
   - D. Seed Implant (6.D)
   - E. Brachytherapy Tx planning (6.E)
7. **Quality Control and Error Prevention** (7.*)
   - A. Prospective QA tools (7.A)
   - B. Patient-specific QA (DQA) (7.B)
   - C. Retrospective tools (7.C)
8. **Shielding & Radiation Safety** (8.*)
   - A. Linac rooms (including design and radiation surveys) (8.A)
   - B. HDR (8.B)
   - C. Simulator Shielding (CT, PET, MRI) (8.C)
   - D. Maximum Permissible doses(personnel monitoring, pregnancy) (8.D)
   - E. Education, Training, Reporting (8.E)

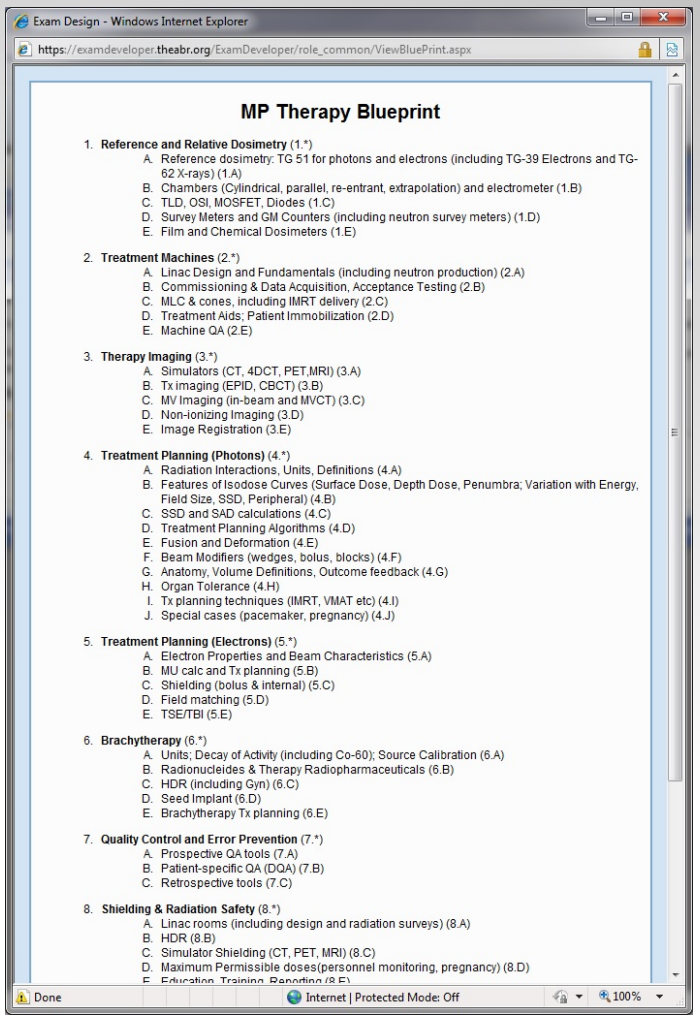
Done | Internet | Protected Mode: Off | 100%

BP	Simple used	Simple unused	Complex Used	Complex Unused
1.1	10	3	1	0
1.2	5	2	2	0
1.3	6	1	3	1
1.4	8	0	4	0
1.5	0	0	0	0

Writing assignments based on need

Exam Library Question Review

- >900 questions written over 18 years
- Still clinically relevant?
- Good question?
  - No: can it be rescued/rewritten?
- In ABR format?
  - Quick edit
  - Rewrite
  - Eliminate from Pool



How Long Does Writing Take?

- Simple question (1 step)/complex question (2 steps)
- Good question writing is an acquired skill
- ~ 1 hour for simple, ~2 hours for complex question
- Experiment: Try to write a good question based on what I am going to tell you

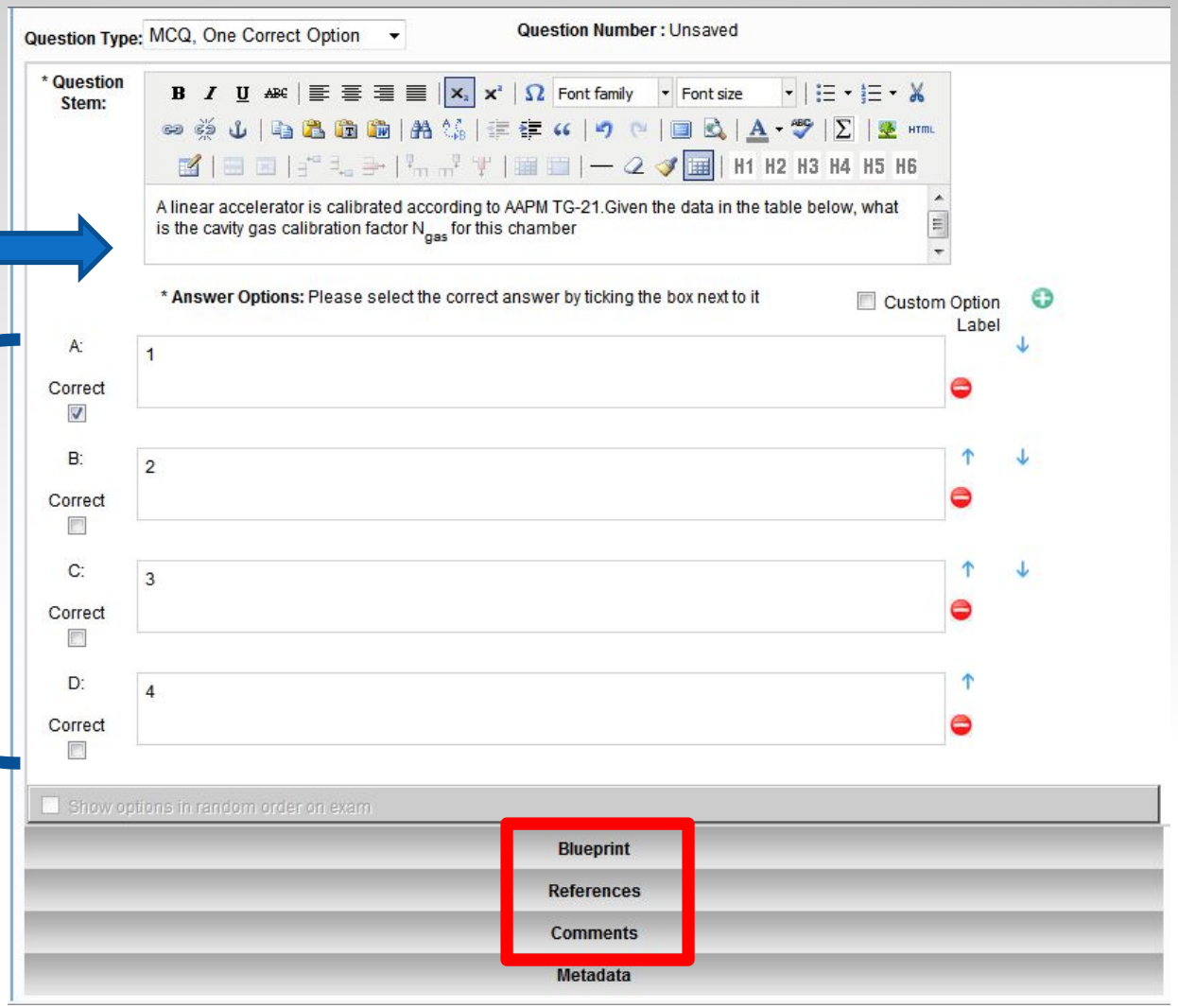
Types of Questions

- Calculations, e.g.
  - SAD/SSD conversions
- Information recall, e.g.
  - Tolerances of QA tests
- Clinical judgment, e.g.
  - What is the follow-up to this QA test result?

Exam Developer Software

Stem

Answer Keys



The Following Demo Question is from an Outdated AAPM TG to Avoid Any Overlap with Current Exam Questions

What Makes a Good Stem?

1. Linear Delivery & Cover Test

Good

A linear accelerator is calibrated according to AAPM TG-21. Given the data in the table below, what is the cavity gas calibration factor N_{gas} for this chamber?

Bad

Calculate the cavity gas calibration factor $N_{gas.}$ The data for the chamber used is listed below. Assume AAPM TG-21 is used as calibration protocol.

2. Completeness

Good

A linear accelerator is calibrated according to AAPM TG-21. Given the data in the table below, what is the cavity gas calibration factor N_{gas} for this chamber?

Bad

Given the data in the table below, what is the cavity gas calibration factor N_{gas} for this chamber?

3. Single Concept

Good

A linear accelerator is calibrated according to AAPM TG-21. Given the data in the table below, what is the cavity gas calibration factor N_{gas} for this chamber?

Bad

A linear accelerator is calibrated according to AAPM TG-21. Given the data in the table below, what is the cavity gas calibration factor N_{gas} for this chamber, and which gradient correction should be used?

4. Positively Worded

Good

A linear accelerator is calibrated according to AAPM TG-21. Given the data in the table below, what is the cavity gas calibration factor N_{gas} for this chamber ?

Bad

A linear accelerator is calibrated according to AAPM TG-21. Which of the following component is not used to calculate the cavity gas calibration factor N_{gas}?

5. Clinically Relevant

- Example: Technology
  - Orthovoltage? Maybe not …
  - Tomotherapy? Yes, but to what detail?
  - Vero, Viewray, CK, Protons, Mevion …

- Example: Clinical Techniques
  - Electron boost for neck nodes? Standard of care 10 years ago, now replaced by IMRT
  - Timing of retiring questions, introducing new techniques

6. Non-controversial

- Usually new topics without guidance documents, e.g. Detector response factors in small field dosimetry
- Time needed after guidance document publication for clinical implementation
- Clinical implementation to consistent residency training

Examples for Good Answer Keys

Good

- Three options:
  - Increase
  - Decrease
  - Stays the Same
- 4 Options in Pairs
  - S/N increases
  - S/N decreases
  - Resolution increases
  - Resolution decreases

Bad

- Length and structure change:
  - S/N
  - FOV
  - Missing tissue artefact
- One pair:
  - S/N increases
  - S/N decreases
  - Resolution increases
  - Missing tissue artefact

What Comes Next?

- Questions get added to exam library
- Next step: selecting questions for the exam

ABR Therapy II Writers

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