2003 ABR Therapy Physics Oral Type Exam Questions

Shown CT scout image, what modality is this image, what is it used for?
q Explain how CTs used in constructing DRRs, explain details re:DRRs.
q Example lateral pelvic field, is the DRR the same for SAD setup vs SSD setup?
q Define CT#, HU, how are they used in RT planning?

Shown kerma and dose curve, explain.
q (Points to portion of curve beyond dmax) If you put an ion chamber right there, which are you measuring, kerma or dose?
q How do you convert this reading into dose?
q Led into TG-51, discuss how you do it.

Shown AP chest field with cord block, discuss factors affecting cord dose (energy, block width), how many HVLs are your blocks? Which beam has sharpest penumbra of Co-60, 6X, 10X, 18X? (he was pushing towards 10X but seemed to cut some slack when I told him Iâ€™d only worked with 6X/18X)

Shown diagram of flouro beam incident on patient
q In which directions is scatter greatest, smallest?
q How is this situation different interactions-wise from therapy beam scatter?
q What are maximal sidescatter and backscatter energies?

Shown CT-MR fusion images from ADAC, explain what this is, how you do it, why do you want to fuse CT-MR? Does this appear to be a good image fusion?

How/what would you estimate gonadal/fetal dose for a woman with breast ca receiving tangents + e- to a TD of 60 Gy?
q Where do you find guidance on this?
q What can you do about it?
q What dose levels would cause you to be concerned about fetal risks?
q What are the magnitudes of the risks?

Ir-192 vs Cs-137 vs I-125: Discuss physical and radiological properties, radiation safety aspects, uses, clinical aspects.

Brachy patient (Cs-137) needs a CT after applicators are loaded, how do you handle it? Would your answer be different if the implant were an Ir-192 sarcoma implant? How/why?

Photon and electron cal depths for TG-21 and TG-51, discuss some details about how you do TG-51. What are the differences between TG-21 and TG-51, procedure and physics-wise, discuss rationale for replacing TG-21 with TG-51.

What are the differences between a diagnostic CT unit and a dedicated CT-sim unit (table top, bore size maybe, lasers, virtual sim software perhaps)

Shown simplified diagram of arrangement of TSET fields on cylindrical phantom.
q Do you recognize this, what is it?
q What diseases are treated with TSET?
q What e- energies are used?
q Discuss dosimetry, PDDs of TSET beams.
q What areas are underdosed with TSET, what do you do about it (e- boost or orthovoltage boost)

Shown CT-MR fusion images from ADAC, explain what this is, how you do it, why do you want to fuse CT-MR? Does this appear to be a good image fusion? This was essentially the same question as before but with a slightly different picture, this one was of a stereotactic CT with an MR). The discussion led into a few basic SRS questions, what are tolerance doses for brain, fractionated and single fraction SRS?

Shown diagram of Ir-192 LDR implant brachy room with dose rates in mR/hr.
q Do you see any problems (there are at least one or two)?
q What would you do about it (empty adj. room, add temp. shielding?
q What is missing from this diagram? (notation of portable shielding)
q How would you calculate stay times for nurses?
q What are your nursing instructions?
q What are applicable dose limits?
q Discuss dose limits for pregnant radiation workers (how does it work administratively)

Shown e- beam in tissue which encounters a slab bone inhomogeneity.
q What happens dosimetrically?
q What can you do to make it better?
q How thick does the internal shield have to be?
q Discuss backscatter dose enhancement on the superficial side of the inhomogeneity.
q What e- energy would you recommend to treat a 2cm thick buccal lesion with?

Shown diagram of klystron, magnetron. What are these, what are the pros and cons of using each in a linac? What physically happens in your linac when you program up an e- beam? One foil or two scattering foils, what are they made of, what does the first and what does the second foil do?

Shown radiation damage vs dose curves.
q What are curves a-d? (LNT, hormesis, supralinear, threshold)
q Discuss each curve
q Where did the data come from to generate these curves?
q Why is the low-dose region labeled as â€œuncertainâ€□?

Shown picture of cylindrical and pancake ion chambers. What are these, what is each used for? Where is the effective point of measurement for each?

Shown TG-43 equation (which had a minor error in it, itâ€™s supposed to be dose rate at r, theta not dose at r, theta). Explain each of the terms. How would you do TG-43 dosimetry for a Cs-137 source? How do you do it for other sources?

Shown CT-MR fusion images from ADAC, explain what this is, how you do it, why do you want to fuse CT-MR? (third time I got this question)

Shown schematic of e- beam going through linac, through treatment head, and out.
q Why is there such a thing as the virtual source for electrons?
q Have you ever measured the VSD?
q How would you /did you do it?
q How do you or do you use the VSD clinically?
q How do you calculate electron beam MUs at your institution?

Shown White I, Yellow II, Yellow III rad material shipping labels. What are these, when do you need to use each (transport index and surface readings)? Are you the RSO at your facility? He seemed to back off a bit when I answered â€œnoâ€.

Shown CT cut of H&N neck area with isodoses, the parotids and cord were outlined.
q What part of the body is this, what type of disease are we treating?
q What are the critical structures? Point out the target (it was also contoured so pretty easy).
q What type of beams were used to generate this isodose distribution? (Obviously IMRT due to â€œdonut holeâ€ of dose around the cord and â€œdipsâ€ in the high dose areas around the parotids).
q Do you do IMRT â€“ discuss your IMRT QA briefly.
q Discuss IMRT in the H&N region vs IMRT for the prostate (localization, organ movement, critical structures, beam arrangements)

Shown anatomical drawing of female thorax with nodes.
q Indicate where the SCLAV, axillary, and internal mammary nodes are located.
q How do you treat each of these say with a four or five field technique?
q Treat to what doses?
q How do you treat the IMC?

Shown three scenarios (simple diagram which I now see is Figure 7-15 on page 126 of Karzmarkâ€™s book) of e- beam entering 90 degree bend magnet.
q Discuss the effect of each situation on e- beam flatness and symmetry.
q How would you try and fix it (examiner seemed satisfied with me explaining which pots to tweak and how I adjusted steering once on a Varian machine).
q Does a 270 bend magnet focus the beam differently than a 90 degree magnet, which is better?