2008_Therapy_Part II_Type

- Which scanairo would you most likely talk to the Dr.?
A. if he had a small cut-out to place on the skin and he ordered 12 Mev electrons?
B.
C.

- Which curve represents 18 Mev , 6x6 FS

- Had several curves, asked to select which one was 6x6 from field sizes of
4x4, 6x6, 10x10 or 12x12

- Orders for 30 fractions, AP/PA, 180cGy/fx SAD. When will the cord dose reach 4500cGy?
TAR PDD and TMR tables given, Separation is 12 cm, Cord is 5cm posterior

20fxs
24fxs
26fxs
28fsx

- What is the dose for irreparable damage to the kidney?
1000cGy
2000cGy
3000cGy
4000cGy

- Two isotopes Pd (lamda = .016) (rho =) and I125 (landa = .   )(rho =) half life is 17 days for
  Pd and 60 days for I125. After 120 days what is the ratio of doses?

- Monte carlo calculations stop calculating at what energy and bundles everything into one
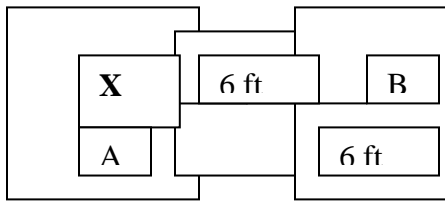
10 kev
100 kev
200 kev
500 kev
1 Mev

- How often according to TG40 should the wedge latch be checked?   Monthly

- What are Monte Carlo space files???
 A. It registers where electrons are in space for calculation???????
 B.

- A picture of a DVH
- Shows critical organs, PTV and GTV curves. Choose which curve represents the GTV

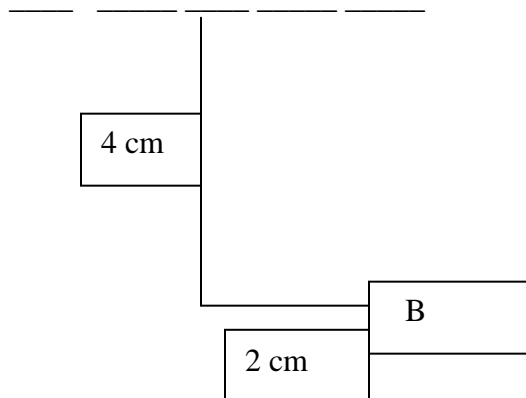- 13.05 nC exposure,   W/e = 33.3J/c   2.58 x 10 R/C What is the volume of gas in the
  chamber?

- TG51 calculation. You have to calculate Ppol, Pion and TPC (in kPA). Mraw high and low given, everything given.

- What is the range of a Y 80 beta 2.2Mev in air?
10 cm
20cm
100cm
200cm
400cm

- Effective energy of an electron Ez 4 Mev, depth is 1.7cm and an Eo is7.1 Mev Two energies given.

- Picture of squares, 3cm, then 2 cm then 1 cm which equals tissue, bone and air. What is the effective depth when the beam is directed through each material.

- A universal wedge has a 0.65 wedge factor. A 60 degree wedge is needed. 100 Mu are given for open and 200 Mu given for the wedge field. What is the average WF?

- Overall uncertainty according to TG40? 6%, 5%, 4%, 3%

- If the collimator rotation is off 1.2mm, the couch rotation is off 1.4mm and the gantry rotation is off 1.5, according to AAPM what is the overall uncertainty?

- Gap calculation: SAD 90 depth =10, FS = 24cm , but the treatment distance is changed to 100 SAD, d=10, FS=32cm

- Calculate the steradian of a 50cm diameter area on a standard linear accelerator.

   a. .137
   b. .122
   c. .187

2m
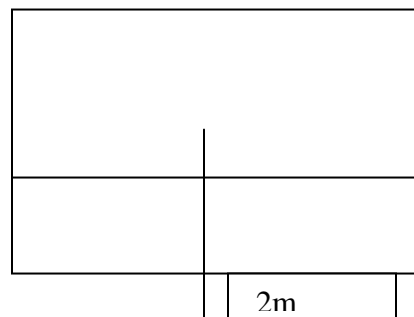
- HDR shielding question. How much thickness for 10 patients per week, 5 days a week, 500cGy/patient. The drawing showed a distance of 2 meters (I think that's what it meant).

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┌──────────┬──────────┬──────────┐
│   X      │  6 ft    │    B     │
├──────────┼──────────┴──────────┤
│   A      │        6 ft         │
└──────────┴─────────────────────┘
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- For an instantaneous exposure it gives 30 mR. If a secretary is sitting at point B and the wall is shielded for 6X how many patients a week can be treated for a weekly dose of 0.02mSv?

- Shielding question that gives a thickness of concrete and the room is shielded for 6X. How much more shielding is required for 18X?

- Why do the doctors leave a strip around each side of the treated area on a sarcoma?
A. for lymphatic drainage

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────  ──────  ────  ──────  ──────
                    │
         ┌──────────┤
         │  4 cm    │
         └──────────┤
                    │
                    │        ┌──────────┐
                    └────────┤    B     │
         ┌──────────┐        │          │
         │  2 cm    │        └──────────┘
         └──────────┘
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- What is the dose to point B?
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1. Range of Sr90 in air
2. Universal Wedge, WF = 0.2, what % MU needed for 30 degree effective wedge
3. What does a fMRI measure
4. What is primary purpose of a bending magnet?
5. 1 R delivered, 3x10-10 C measured… what's the size of the chamber?
6. 30 cm2 field directed at roof, what is sold angle subtended at a point on the ground?
7. HDR Cylinder with 5 sources 1 cm apart. Point A is midline, 4 cm from sources and receives 200 cGy. Point B is 2 cm lateral to Point A. What is Point B dose?
8. Increasing the current to the magnetron does what?

9. Retrofit a linac to perform IMRT… how much shielding do you need to add?
10. What is the source of electrons in an electron treatment?
11. Given density of lead and mass atten coef for a random energy… what is TVL?
12. You check the source strength from the vendor 2 weeks after receipt. Given calibration factor, and reading… how far is the vendor off?
13. Given DVH curve… which curve has the least homogeneous dose?
14. Given DVH curve… points to a line, what is it? Answers were PTV, GTV, OAR, Volume receiving 100 of dose
15. SRS treatment, 4mm cone… what is max dose? Answers were 10 Gy, 20 Gy, 40 Gy, etc
16. All readings, voltages, kq, Nd,w, temp & pressure… how many cGy per MU?
17. You calibrate a machine with the outside temp and press…. But this is the inside temp and press… how far off is your output?
18. Treating with parallel opposed wedge fields for 60 Gy in 30 fxs and the MU per beam in 160 MU. After 10 fxs… realize WF was not in calc. How many MUs required for remaining 20 fxs to get to 60 Gy?
19. Electron Eo = 7.1 Mev, mean E at 2 cm = 4 Mev… what is range?
20. According to TG51… you need to adjust you %DD by what?
21. What happens to surface dose and %DD by adding a physical wedge?
22. Three layer material. First layer is 3 cm thick, HU = 0. Second layer is 4 cm thick, HU = -800. Third layer is 2 cm thick, HU = -100. What is effective depth?
23. Why cant MRI be used for hetero corrections?
24. Why should you convince the doctor to not use a 25 cm x 3 cm electron cutout?
25. You have a half beam 6 MV photon beam and a parallel 9 Mev electron that match on skin surface… where is hot spot?
26. What is definition of EUD?
27. What is definition of integral effective dose?
28. What part of curve is an ion chamber used for calibration operated in?
29. Why would a doctor use Pd103 instead of I125 for prostate implant?
30. Which part of linac is not water cooled?
31. Given an axial cut with weird dimensions drawn all over it… had to determine LPO angle? Easy geometry
32. Probably 10 MU calcs that I thought were very hard.
33. Probably 5 or 6 TG43 brachy physics calcs
34. According to TG40… how often do you check wedge interlocks?
35. Probably 5 or 6 shielding calcs.
36. You use a 3x3 electron cutout… what doesn't happen? Dmax decreases, output decreases, flatness decreases, range decreases
37. Probably 3-4 questions where you had to know that Total Dose = 1.44 times Half Life time Initial Dose Rate

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1. giving a dose rate constant of I125 (Ir192?) measured experimental 0.7, two numbers calculated by Monte Carlo method (0.64, 0.67), something like that, ask according to TG-43, which one to use in planning system, 0.64,0.67,0.7,0.65 (the experiment one, one of the Monte Carlo one, or the average of the two Monte Carlo)

2. The universal wedge question like the one we had in the old exams, given a universal wedge, wedge factor= 0.25, to make a 30 degree wedge, what's the MU ratio of the wedge field and open

field. I didn't know we need to assume the universal wedge angle is 60 degree until today, I thought something is missing in this question when I was working on it from the old exams.

3. one of the shielding questions like the old one, an office will be add next to the storage room, distance to the point in storage room from the source is 6meters, to the point in office is 12meters, the reading in the point at storage room is 0.6mSv/hour, how many patient can they treat per week to get less 2mSv/week in that point in the office, the barrier between storage room and office has no attenuation, beam shoot on the barriers only 30s per patient, clinic is running 5 days per week. somehow I just can't get a number close to one of the answers.

4. Some of the questions have the answers are very close, I remembered one of the TG-51 calculation questions, the answer is like, 0.62,0.63,0.64...something like that, I got the answer is like 0.624 first time.

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1. TG-51 calc. Given raw data. Need to calculate Pion and Ppol. Need to know standard pressure in kPa. Find dose at isocenter if 100 MU were given. Also given rcav which I didn't use.
2. Shielding –lots.
3. HDR calculation using point source formalism from TG-43 (given dose rate constant, radial dose function, some other stuff)
4. Treating a stereotactic lesion in the head with a 4 mm diameter beam. What is the largest dose you can prescribe?
5. Standard Gap Calc between a treatment with an SSD setup and a treatment with an SAD setup. Answer was 1.95 cm gap on skin. Options included 1.9 cm and 2 cm. I chose 2.
6. Photon and electron field
7. Concrete is used for neutron sheilding for what reason? (thermalizes neutrons was my answer)
8. Using lead and concrete to shield Primary wall. From the inside, what is the order of the materials? (lead then concrete, concrete then lead, other combinations)
9. Given 125I half life of 59.4 days, given exposure rate constant in cGy/hr/U or cGy/U/hr. After 30 days what is the dose rate to the tumor in mSv/hr?
10. 200 keV beam. The density of copper is given in g/cm^3, and the μ/ρ for copper is given in cm^3/g. If 3 mm of copper attenuates the beam to 63% of its original intensity, what is the TVL for copper?
11. Shielding: the distance from isocenter to point S is 6m, and iso to point Z is 12m. Point S is in a store room and point Z is in a room being considered as new office space. A survey meter measures 0.2? cGy/hr at point S. A beam is aimed toward this primary wall for 30 seconds per treatment. For a maximum dose of 0.08? cGy/week at point Z, what is the maximum number of patients you can treat per day? Consider only photon interactions.
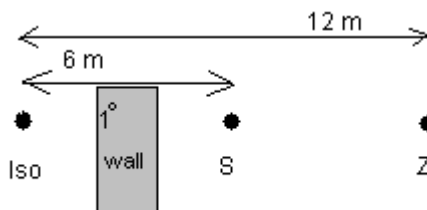
12. Given 5 HDR sources. 1 cm between each source dwell position. 4 cm between middle source and point A. The dose at point A is given. What is the dose at point B. Equal dwell times for all sources. (Also given source active length which is less than 2*distance, so I treated as pt sources)
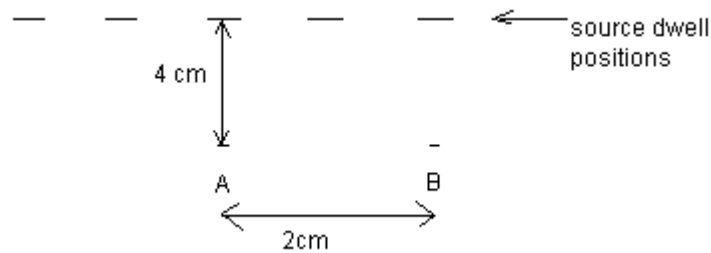
13. A setup calls for a 25 cm field length at 100 SAD. The SSD is 88 cm. However, the field requires a wedge that has a field size limit of 20 cm at isocenter. What must the new SSD be in order to accommodate the wedge?
14. Find the RPO angle given the following (diagram). The line represents the central ray of the beam through the patient.
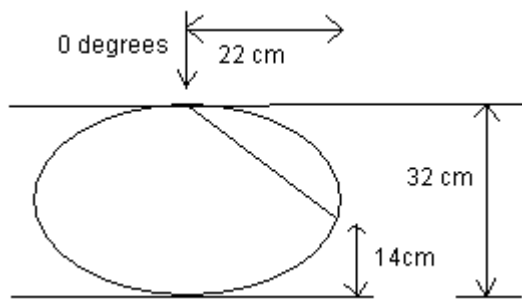

15. Parallel opposed fields with equal weighting. 60 Gy in 30 fractions is prescribed to the isocenter. The fields are equally weighted. (SAD setup with iso at midsep). The patient separation is given, as well as the depth to the cord. The TMRs at three different depths are given. Find the maximum number of fractions that can be given with the limitation being the cord tolerance dose.
16. Memory foggy on this one: You measure a brachy source and get a measurement in air at 1 meter of (given)R/S. The chamber volume is given, the chamber calibration factor is given (in cGy/C?). You are given the density of air in kg/m^3. The stated activity from the manufacturer is given. Given 0.876cGy/R, given 33.95 J/C, NOT given 2.58E-4 C/Kg = 1R. What is the relationship between your measured dose rate and the dose rate stated by the manufacturer?
17. For a photon skyshine calc, What is the solid angle of a circular beam with a 50 cm diameter? (0.187)
18. A beam travels through tissue (see diagram). What is the radiographic depth?

3 cm	HU = 0
4 cm	HU = -800
2 cm	HU = -200
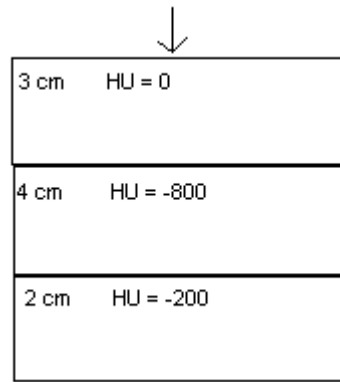
19. A Shielding calculation was performed assuming no IMRT. If you will now be doing 50% IMRT, how much additional shielding will you need to add?
20. A universal wedge with a wedge factor of 0.25 is used to deliver a beam with and effective wedge factor of 30 degrees. What is the fraction of MU's delivered by the wedged portion of the field. (There were 2 questions like this. For this question, I tried using both the Tatcher universal wedge equation and the equation from Greene and Williams (Linear Accelerators for Radiation Therapy). BOTH answers were in there. Maybe both will be counted as correct???
21. Shown a setup with AP, Lt Lat, and Rt Lat fields. The Rt and Lt Laterals were wedged. The isodose distribution looks like the picture below. Another picture with a uniform isodose distribution is shown. You must choose which field weights and wedge weights to change in order to make the picture below look like a uniform isodose distribution:
   You are given a choice between answers like this:

 | RT LAT wt | LT LAT wt | AP wt | RT lat wedge | Lt lat wedge |
    |---|---|---|---|---|
    | decrease | increase | same | increase | increase |
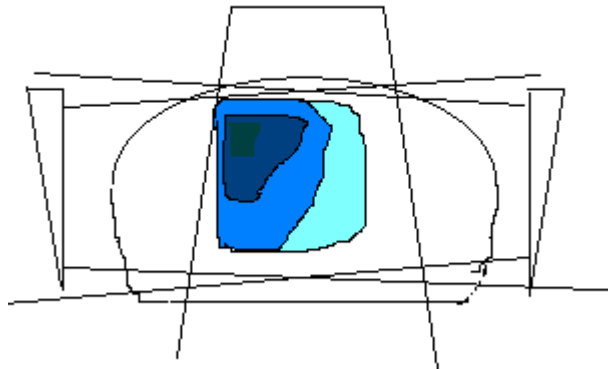
22. Electrons are produced in a linac by (thermionic emission from anode, thyratron anode, heating a filament, etc)
23. When the current in the magnetron increases: The magnetron voltage increases, other answers I can't remember.
24. Overall error expected according to TG-40
25. definition of QA
26. definition of wedge factor
27. Meaning of Equivalent Uniform dose (given a non-uniform dose distribution, find the uniform dose that gives the same biological effect)

28. Shown DVH and must choose the DVH line representing most heterogeneous dose distribution
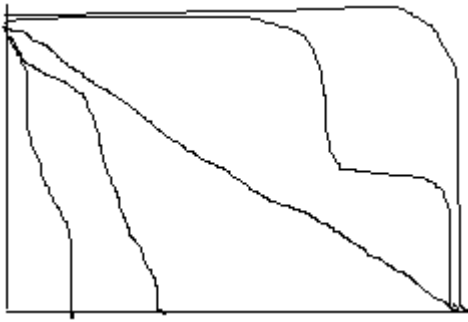
29. Which structure does line 2 represent on this DVH for an IMRT plan? (organ at risk, GTV, PTV, etc) It was an obvious PTV
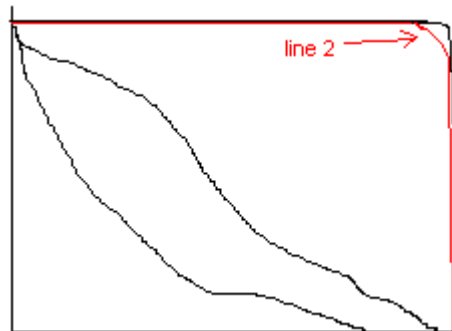
30. Why, when treating an extremity, do we block out a sliver of skin? (spare lympatic system, aid in skin healing after radiation, other choices)
31. When treating a lung tumor, what is the dose associated with radiation pneumonitis? (V20=30%, V50=10% etc)
32. Neutron dose from 15 MV photons: (2%, 5%, etc)
33. All of the following change when an electron beam is made significantly smaller by adding a cutout EXEPT: Rp, dmax dose, etc.
34. When an electron beam has an oblique incidence on the surface, what happens? (how does it change dmax, Range, etc) (Khan p.321, 3rd ed.)
35. According to Bragg-gray cavity theory, the diameter of the air cavity should be (greater than the range of radiation in cavity, same as range of radiation in cavity, less than range of radiation in cavity – Khan p.114)
36. In which region would a cylindrical ion chamber be operated on a voltage versus ion pairs collected graph?
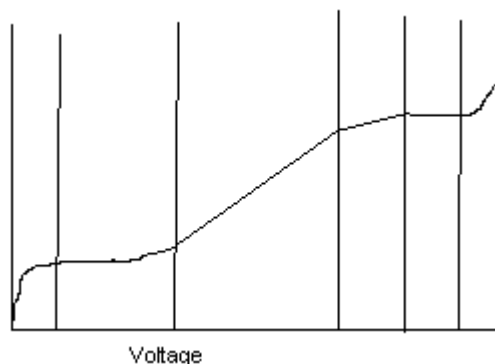
37. In Monte Carlo Treatment Planning Algorighms, what is the cutoff energy under which the path a particle will no longer be mapped discretely, and instead it will be lumped in with a general energy distribution function. (100keV, 10 keV, 1keV, two other options)
38. How much do shift your curve to get a PDD (PDI?) curve? Options included 0.6rcav upstream. It was the only one that made sense.
39. What is the purpose of the bending magnet. Options included: to accommodate a horizontal waveguide, and to focus the electron beam on the target.
40. There was a question that required you to know that the bending magnet was NOT between the target and primary collimator. It may have been included in the previous question.
41. On fluoro images in the simulator, wires used toward the outer edges of the field of view can appear to be (farther apart?) than they actually are. This is due to: image intensifier, automatic brightness control, scatter grid, another choice I don't remember.
42. A dose calc where you have SSD, Dose rate at Dmax for 100 ssd setup, and a depth of 10 (PDD given). For the given setup, they give you the MU required to give the dose. for the same dose delivered to an SAD field at a depth of 10 (They stated the TMR), how many MU's do you need? Need to do a back calculation to get the output factors that are not mentioned, then do the SAD calc and include the output factors.
43. Prescription is 200 cGy/day delivered by parallel opposed, equally weighted beams. They say they gave 147 MU per beam, but left out a wedge factor of 0.8 for the first 10 treatments. The patient is to receive 30 treatments total. What is the MU required (per beam) for the remaining 20 treatments in order to deliver the prescribed dose for the entire course of treatment?

No questions on TBI this time. No questions about occupational or public dose limits. Lots of dose calcs. No electron calcs that I can remember. A sizable amount of rather obscure information was included in the simple questions. Most of the complex questions were more reasonable but I ran out of time and had to guess on the last few. Don't waste time on the simple questions you don't know!!