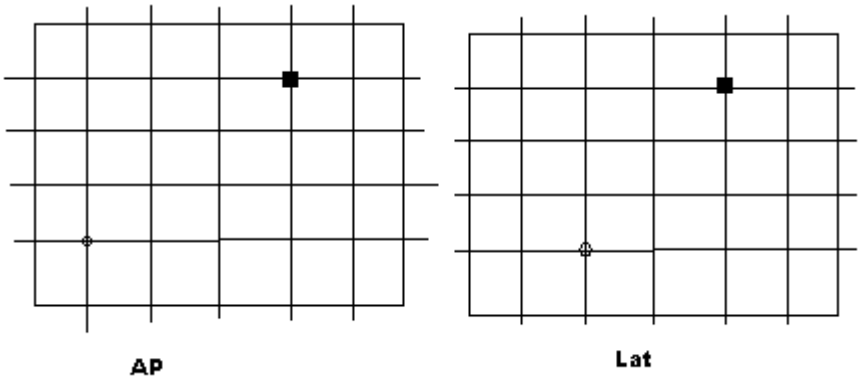
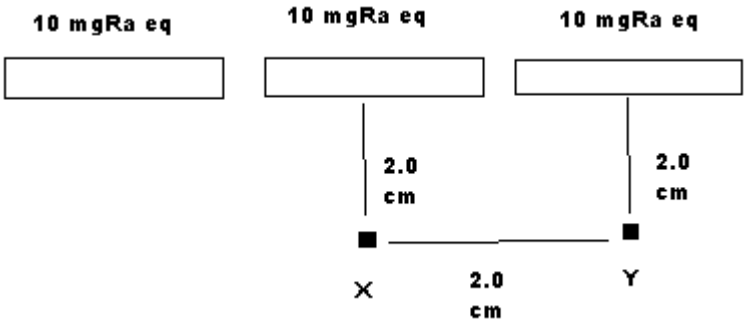
What I remember from ABR Exam 2005 PART II

Disclaimer: This is only what I remember, the problems can be poorly formulated. I am not responsible for misunderstandings.

1.- Given the grid in which every line intersection is at 1 cm. Determine the distance between the source (black dot) and the point of interest (white dot).



2- Given three linear sources as in the figure, determine the ratios of the dose at point Y respect to point X.



3- Tables of 4 MV and 6 MV PDD and TMR VS field size were given in two sheets of paper. At the very bottom of the PDD tables for both enegies, a column with the BSF for every field was given. BSF, not Normalized Peak Scatter Factors were given. The calculations were to obtain MU settings for different field sizes:

-In general: most of the time the calibrations were at SSD + dmax.
-In some problems the Sc,p was not given. Even the whole exam doesn´t refers to this magnitude like that (in some other problems OF was given, which is Sc,p)
- Use of SAD and SSD setups, change in SSD´s (to require one to use the Mayneord factor to get the new PDD at a different SSD).
- Calculate the dose to cord at 4 cm, given every thing needed for a SAD setup.

4.- A shielding problem like: Available space 36 inches. Required thickness of concrete was 66 inches. TVL for concrete = 13.6 inches. TVL for steel 3.8 inches. Determine how much of steel has to be in the 36 inches wall for the shielding to work out.

Hint: develop a system of two equations and two unknowns (X, Y being the thicknesses of concrete and steel).

5.- The same method (a system of two eq. and two unknowns) can be used to quickly solve for problems like: How many fractions with a PA cord block if after the block is added the dose to cord is reduced to 18 % of what was being given without it. Total of dose to isocenter 6000 cGy, total dose to cord 212 cGy per fraction. Constrain: cord dose can not be more than 4500 cGy
Hint:
eq 1: x Dose to cord + y * 0.18 * Dose to cord = 4500 (Dose to cord 212 cGy/fraction)
eq 2: x Dose to iso + y Dose to iso = 6000 (Dose to iso = 200 cGy/ fraction)

6.- Again a problem in which two post oblique fields traverse 9 cm of lung. Detph of isocenter from the two posteriors is 18 cm. TMR given for 3, 5, 9, 12 and 18. (Better formulated in previous years).

7.- A problem in which you had to calculate the thickness of a compensator, given the missing tissue = 5 cm. Density of compensator material and electronic densities of water and compensator material.

8.- A problem in which the transmission factor B had to be calculated given everything you needed. In ALL the radiation protection problems the Xp (effective dose limits were given, so there were no ambiguities in this regard).

9.- Two problems like the ones that appeared in previous years regarding transferring a patient to a Co-60 unit after being simulated and treated in a SAD = 100 cm setup in linac. The treatment in Co-60 had to be done with SSD setup. Thickness of patient given.

10.- HDR scenario: Given activity of Ir-192 source 10 Ci (quickly convert it to mCi´s) , the exposure rate constant of Ir-192 was not given here, I used 4.6 R-cm2/(mCi –hr), then you had to know the f factor also for Ir-192. Balloon with 4 cm diameter. Calculate the approx. time to deliver 340 cGy´s at 1 cm from the surface of balloon.

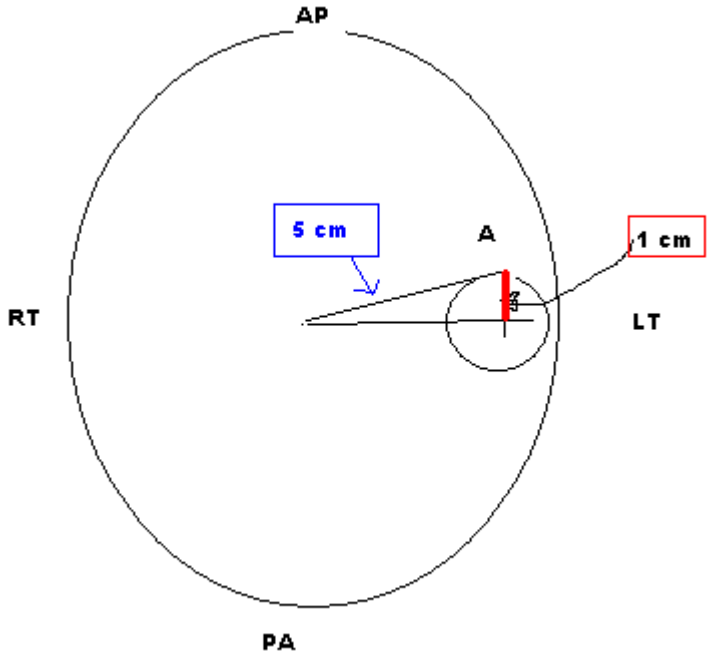
11.- A problem in which the timer error of a orthovoltage unit was + 0.02 secs. The dose rate was 125 cGy/min in water. PDD was 60 % at 2 cm. Determine what is the maximum dose that can be delivered with less than 1 % error without having to take into account the + 0.02 secs.

12.- Another problem in which the leakage transmission factor B had to be calculated. Basically you only had to known that there is a factor of 1000 (1 / 0.1 %) for leakage.

In general, and it is very fair, all the time the T, U and W was given. It is better to leave the decision of selection for an oral test scenario.

13.- Stereotactic radiosurgery scenario: Given a CT image with the rest of the info as given in the picture that follows. How much and it what direction (either one of four choices AP-PA, PA-AP or RT-LT LT to RT) will move if the patient head (or AP beam I don´t recall it) is tilted 1 degree.

Here I don´t remember if the isocenter was centered on the circle or at the origin from where the 5 cm are measured. This is a key issue for solving the problem.



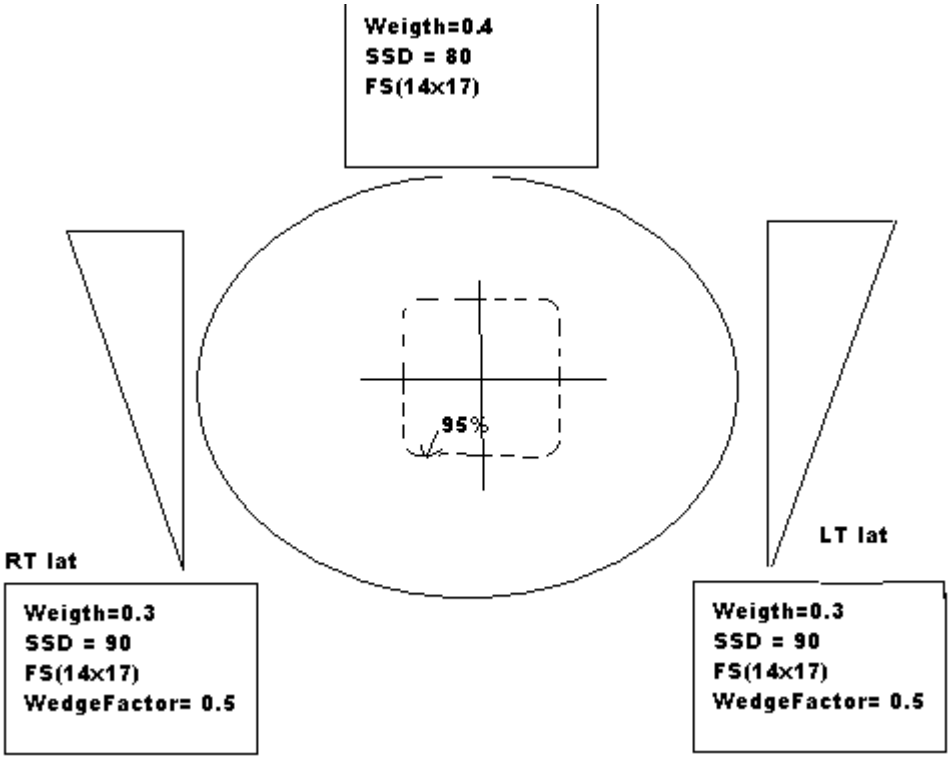
14.- Another problem with a 1 cm grid superimposed on a AP and Lateral Fletcher applicator. Essentially like problem 1. Determine the distance from one of the ovoids to a point. And calculate the dose rate to the point due to that source in that ovoid only. (mgRa eq for the source were given, 8.25 R-cm2/(mCi – hr) one had to know, I think f factor also was not given (source was Cs-137).

15.- Given a universal wedge with Wedge Factor = 0.5. Calculate the ratio of wedged / open field to make the wedge a 30 degree wedge.

Hint: use Tatcher relationship: new Wedge angle = (1-F) Universal wedge angle, and take into account the with a WF = 0.5, twice the mu´s has to be given for the same dose.

16.- Shielding calculation for a HDR room. Ir-192 source 10 Ci, exposure rate constant of Ir-192 given, weekly limit given (0.01 R/week), T = 1 given. And workload W = 100 min/week given. Distance 2.0 meters. Determine B.

17.- What is the ratio of MU´s given the weights of AP = 0.4, RT lat and LT lat = 0.3 to deliver 200 cGy to 95 % Isodose line. Fsize for every was given. WFactor for lat. Fields given. SSD for every field given. Table with TMR´s (FS, depth). Calibration 1cGy/ MU at SSD + dmax.

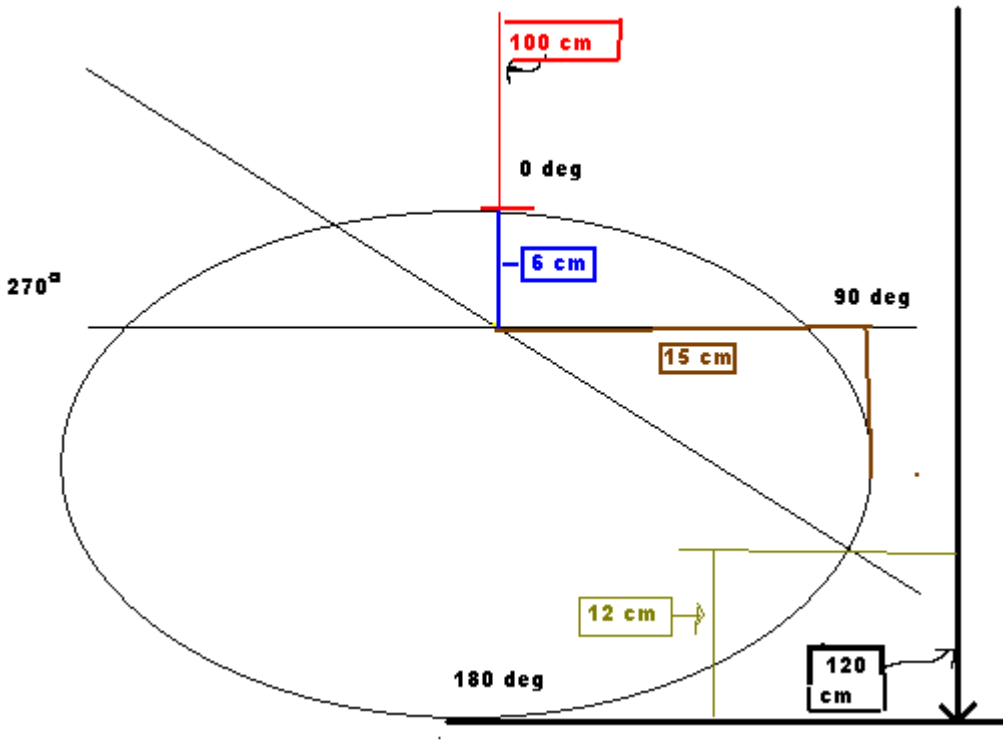


18.- Total dose at 2 cm from one seed of Pd-103 given its dose rate constant (0.868 cGy/hr), g(2cm) was given, Sk for the source was given= 2.5 U. Phi (anisotropy) = 0.939.

19.- Determine the Effective SSD for 6 MeV electrons. Io = 100, at 20 cm gap reading was 44, and at 40 cm gap reading was 25. dmax for 6 MeV electrons not given.

20.- A geometry problem:

Determine the angle, following the IEC convention of angles, of the medial field, given the dimensions in the figure:



21.- What is the change expected in mmHg when reading at 50 meters of altitude from the airport level.

22.- Given the density of air 0.001293 g/cc, chamber with 0.19 cc, given 1 R = 2.58 e -04 C/kg. Calculate the approximate exposure calibration factor of the chamber in R/C.

23.- Three or four problems that are solved using equivalent triangles rules for field sizes transferred from SAD setups to SSD setups.

24.- A DVH was shown. What is true from it?

25.- A graph of raw (not shifted) PDD´s VS depth shown. Diameter of chamber 0.6 mm. Determine the PDD(10 cm).

26.- What percent higher/lower difference is expected when going from TG21 to TG51

27.- What is the meaning of D90 = 110 Gy?

28.- Scatter transmission factor B given distance to patient 1 m, distance to secondary barrier 5 m, field size 20 x 20, alpha= 0.001, W = 500 Gy/week, Xp = 0.02 mSv/week.

29.- A simulator shielding problem. Exposure rate at 1 m was given= 0.01 R/ mAs at 1 m. Workload = 600 mA-hour / week. U = 1/4, d = 3 meters. Xp = 0.01 R/week. Determine how many TVL´s given the exposure rate limit.

30.- Main difference between Magnetron and Klystron. Hint: Klystron is not a microwave generator.

31.- Select proper order of parts in a LINAC. Different orders of parts were given. Hendee's and Khan's book.

32- Main n contribution to dose behind LINAC. Select among neutrons, scatter from patient, scatter from walls, leakage from LINAC head.

33.- Penumbra calculation from LINAC given target surface distance, target block distance, depth in patient and target dimensions.

34.- Radionuclide and energy emission from Sr-90 eye applicator.

35.- The only factor less than 1 in TG-51. Select from Ptp, Pelec, Ppol, Pgrad.

36.- Flatness and symmetry tolerance figure according to TG-40

37.- What percent of a batch of seeds has to be checked in a prostate seed implant procedure.

38.- Tolerance for deviation between light and radiation field according to TG-40.

39.- Necessary thickness of lead for 6MeV electron cut-off

40.- Which components of a LINAC are pulsed after Thyratron is fired?

41.- A tumor is reduced because of its higher mitotic activity , was my answer.

42.- PET cant bring information about (metabolism, metastasis, pathology, TX follow up, tumor)

43.- An error of 2 mm in MLC opening causes an error of xx % in 2cm radiation field

44.- What condition is not required for collimator output factor Sc. Answ: phantom measurements.

45.- What doesn't change by reducing field size in electron beam. Answ: Rp

46.- TVL for neutron attenuation in maze according to ?? is: Answ: 5 meters.

47.- Energy at which theoretically can be produced a neutron in LINAC (6,8,12,16,20 MV): Answ: 8 MV.

48.- Given a graph of ionization current vs polarization voltage with different areas marked select which detector works at specific area

49.- Measurement of the crack in a LINAC vault with high volume IC. Chamber over the crack measures 1 mR/h and far from the crack 0.5 mR/h. Estimate what would be the actual exposure rate (less than 0.5, 1, more than 1, etc).

50.- Calculate the time required to achieved 95% of the total dose for a I-125 permanent implant

51.- Permanent implant of Pd-103. Activity was given. Calculate total dose delivered.

52.- What can be said about TBI. (compensators can be used, requires long treatment distance, lateral irradiation brings higher inhomogeneity that AP irradiation, 5% dose homogeneity could be achieved for all distances). See RAPHEX for a better questions.

53.- Detector resolution required for SRS field profile is (less than 1mm, 2mm, 3mm, etc)

54.- What is the meaning of a phase-space file in Monte Carlo calculations?

55.- Sliding window in IMRT means A, B, C, D, etc?

56.- A set of CT numbers was given -1000, -100, 0, 100, 1000. Select proper order of tissues that correspond with the order of these CT numbers. Air, lung, water, soft tissue, bone were in all possible answer in different orders.

57.- A DVH graph was given. A point on the DVH curve was marked. Select proper meaning of this point from different enunciations.

58.- For what purpose a beam spoiler for 10MV breast treatment is used ?

59.- Amount of X-ray contamination for a 18 MeV beam is around …. %.

60.- Dose limits for the public for frequent and infrequent exposure is ….