**2009 Part II Recall:**

1. For regular photon Linac, the major contribution of photon dose at maze door:
    A. Leakage through maze wall
    B. Leakage scattered through wall
    C. Patient scattered

2. For ion-chamber used for calibration, what is the limit for chamber leakage:
    A. 10^{-12} B 10^{-14} C10^{-10} D10^{-8}

3. Based on TG-66, the tolerance for the alignment of gantry laser with the image isocenter is: +/-1mm;   +/-2mm and so on

4. A question about electron TG-51 calibration. Calculate cross-calibration p.p.l chamber: Kecl*$N_{D,W}$. Given reading M, correction factors, R50, KR50' formula for ppl and dose calibration factor for cylindrical chamber.

5. Physics wedge will:
    A. increase skin dose, increase PDD
    B. reduce skin dose, increase PDD
    C. increase skin dose, decrease PDD
    D.

6. IMRT film QA, two areas with optical density 1.0 and 0.45; film gradient is 1.5, what is the ratio of doses on these two areas?
    A. 2:1   B 3:1   D. 3.5:1

7. What material has the highest neutron production rate: Tin, Lucite, Lead and others

8. Gap calculation: Field A: SAD treatment, SSD=90, d=10 and field size (FS) at SSD=24cm, Field B SSD=100, FS=15 at SSD, what is skin gap to match dose at depth=10cm? Answers: A 1.9cm B2.1cm C 2cm

9. Conformity index = 2.7 and GTV volume =5.4cm^3, what is the volume of tissue irradiated.

10. For megavoltage CT, what is the calibration curve HU to electron density.
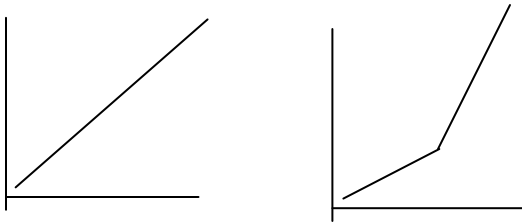
11. Spiral CT, collimator: 4 slices with 1mm thickness, gantry rotation time =1.5s, what is total time to scan 100mm?

12. HVL =2.8cm for some material, $\mu^{water} = 1.9\text{cm}^{-1}$. What is the CT number for the material: A: 1000HU B:2000HU C:100HU D 0

13. Give a CT slice, showing 3cm chest wall, 11cm lung, 1cm tissue to point A, dose to point A is 200cGy and calculated without inhomogeneity correction. What is the real dose to point A? answers include 246cGy, 255cGy

14. What is difference between PDD (%10) and (%dd)x in TG-51:
    A. e- contamination is significant at d=10cm
    B. (%dd) is used to find KQ where (%dd) is used to convert/calculate dose at dmax.

15. where is effective point of measure of p.p.l chamber?
    A. proximal side of cavity
    B. distal side of cavity

16. Wedge calculation: total 60Gy in 30 fx. In first 10fx, 147MU given and then realize missing wedge factor 0.8. To compensate the dose in next 20fx, what is new MU: A. 202MU'

17. Gamma knife: localization error: 1.5mm and some other error 0.5mm, for quadratic total error? (square root of two errors)

18. HDR calibration: Give Sk on some date from vendor, then current measured after two weeks and chamber calibration factor is also given. What is difference between measured and vendor value? (Need to know dose = current * calibration factor * inversed decay correction)

19. Two shielding questions: For 6MV and 18MV, both TVL_1 and TVLe given. Concrete thickness 95cm. To find extra thickness if the room shield is needed if energy change from 6x to 16x. (need to know thickness = TVL_1 + (n-1)*TVLe) .
    The other question is very similar, but given TVL for both 6MV and 16MV, some thickness of thickness of shielding, find difference exposure readings behind the wall. (I can not recall this clearly. But the question is basically to ask you calculate transmission between different energies)

20. For primary wall shielding, Point A is 6m away from isocenter, point B is 12m away from isocenter. The beam is only 30s on the wall for each patient. Dose measured at point A is 0.06mSv/hr. Work load at iso was given. How many patients can be treated that dose at point B will not be greater than 0.02mSv/hr (The same question as No.11 of 2008 exam)
    (Ans: A. 26; B. 30)

21. For electron beam, f slope for gap = 0.0111 was given, SSD=100cm, dm =2cm, what is effective SSD?

22. TG-51, given all parameters, T, P, readings at 150V, 300V, Ppol, Pecl, KQ, Nd,w, and SSD=100cm, PDD(10)=0.753, find dose at dm.

23. A few simple calculation of TG-43, give Sk, dose rate constant, $G(r, \theta)$ following IVS, $g(r)$ and $F(r, \theta)$ given. Basically you need to convert units (cGy <-> Gy, hr <-> min), then you can calculate dose rate and find total dose and so on.

24. What happen if megatron current is increased?
    A. RF power reduce   B. Beam energy increase

25. If bending magnet is not working, what observation you will have:
    A. Dose rate reduce   B. field symmetry change   C. beam energy change ……

26. What is the limiting dose that when 30% of kidney get irradiation and will have irresisipible damage.
    C. 2000cGy   D. 3500cGy .. I don't remember if there is 5000cGy in answer

27. When using regular fractionation (1.8Gy/fx, some number of fx) , what is the TD5/5 of xxxx (a word that I don't recognize, probably some side effect) for parotid. (answers include: 10Gy, 30Gy, 50Gy ….)

28. BED calculation: 54Gy /30fx. Alfa/belta =10Gy, calculate dose per fx if want to deliver in 20fx.

29. Brachy source shield by 2cm lead (HVL = 5.5mm), container diameter 30cm, T=3.26Rm2/hr/mCi (I don't remember the number and unit). What is the max activity can be in the container to make the exposure less than 50mR/hr at the surface.

30. In cone beam CT, if some detectors only works intermittent (I don't recognize that word) , what artifact the image will have: A. band   B. ring C. streaking D.

31. calculate leakage workload: # of patient 20 per day, 5 days per week, dose per patent = xxx Gy. 65% are conventional tx, 35% are IMRT, and C_{IMRT} =4, average treatment PDD = 65%, what is the workload?

32. film cut question, SAD =100cm, separation =22cm, film at 135cm. then want to move to SSD=100cm, what is film distance? Answers: 144cm (I did not get the exact answer, but close to one of this number 146cm?)

33. e- treatment for a superficial lesion with diameter of 4.5cm, 200cGy to 80% IDL, what is MU? Give cone factor of 6x6 (0.98), 10x10 (1.0) and 15x15 (1.02). So you need to decide which cone to use.

34. What kind of heterogeneity correction is used in collapsed cone calculation?

35. IMRT QA point verification should be at: A. low dose high gradient B. High dose low gradient and so on.

36. How many ___% of brachy seeds need to be surveyed and at what percentage different___ that you need to report to vendor?

37. Which is the most sensitive device to detect ^{125}I:
    A: G-M counter   B. Thin-window G-M counter

38. A 9-inch polyethylene sphere surrounding BF3 with cadmium rod is best to measure:
    A. thermal neutron   B. fast neutron