Chapter 11

1. Central axis depth dose distribution depends on beam energy. Which of the following is true? 8:210

   1. *Depth of a given isodose curve increases with beam energy*
   2. *Absorbed dose outside primary beam is greater for higher energies*
   3. *An advantage of orthovoltage is increased scatter dose*

   A. 1 only
   B. 2 only
   C. 3 only
   D. 1, 2, & 3

2. The percent depth dose for a 15 x 15 field size Cobalt-60 beam, 9cm depth and 80cm SSD is 62.3. Calculate the percent depth dose for the same field size and depth for 100 SSD. 8:168

   A. 56
   B. 60
   C. 63.2
   D. 64.7

3. A bulge on the lateral region of the isodose curve at depth is most often associated with: 8:210

   A. Low energy photon beams
   B. High energy particle beams
   C. High energy photon beams
   D. Tightly collimated beams

4. The output of a Cobalt-60 teletherapy unit is 90 cGy per minute at a distance of 80.5 cm. Calculate the time necessary to deliver a midplane dose of 200 cGy at a PDD of 63 and a 1.02 backscatter factor3:26

   A. 1.27 min.
   B. 3.46 min
   C. 3.60 min.
   D. 5.02 min.

5. A patient is treated on the 6 MV linear accelerator.. The patient is setup to 94 cm. SSD. The TAR at 6 cm depth is 0.888 and the output in air at the isocenter is 1.02 cGy/monitor unit. How many monitor units will it take to deliver 100 cGy to a depth of 6 cm?. 3:31

   A. 98
   B. 110
   C. 112
   D. 116

6. Which of the following is an advantage of a source-axis distance treatment compared to a source-skin distance treatment? Assuming a patient is not required to move in either step up. 8:267

   A. PDD is improved
   B. Laser localization is improved
   C. Table adjustments between fields are not normally required
   D. Fields are delineated

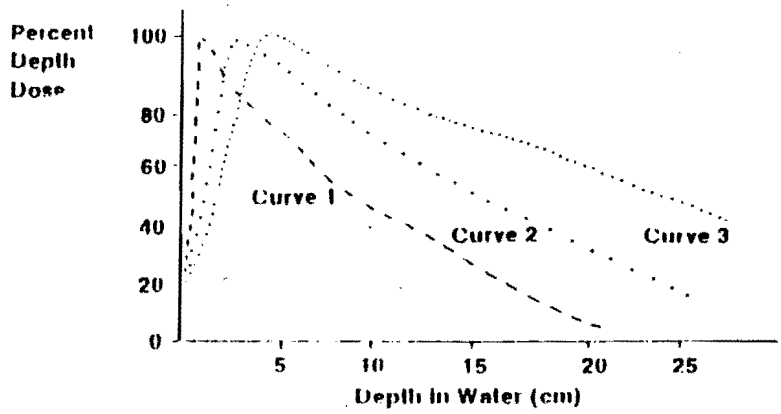
7. The Mayneord F factor that compensates for change in central axis depth dose includes corrections for:

   A. Penumbra
   B. Field size
   C. Tissue absorption 8:167
   D. Inverse square law

8. A dose of 3000 cGy is to be delivered at a depth of 8cm at a %DD of 76%. what is the dose to an underlying organ at 14cm at a %DD of 58%? 2:58

   A. 5172 cGy
   B. 2289 cGy
   C. 3947 cGy
   D. 4231 cGy

Pertaining to the depth dose percentage curve, answer questions 9 and 10.



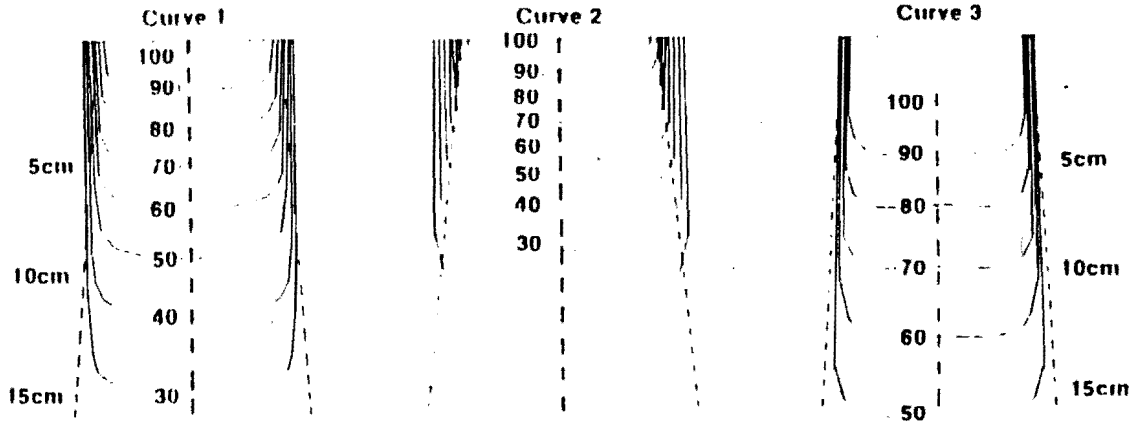
9. Which of the following curves represent the beam possessing the lowest energy? 8:161

A. Curve 1
B. Curve 2
C. Curve 3
D. All possess the same energy

10. Which of the following beams will result in the greatest amount of skin sparing, all other factors remaining unchanged? 8:162

A. Curve 1
B. Curve 2
C. Curve 3
D. Unable to determine

Pertaining to the isodose curve diagram, answer questions 11 to 13.



11. All of the curves represent different quality beams at 10cm x 10cm field size. These can be classified as: 8:211

A. Isodose charts
B. Penumbra charts
C. Inverse square charts
D. Flattening charts

12. All of the charts represent different beams at a 100cm SSD and 10cm x 10cm field size. The beam possessing the lowest energy is represented by: 8:211

A. Chart 1
B. Chart 2
C. Chart 3
D. All possess the same energy

13. Pertaining to the charts, which of the following beams would have a depth dose of approximately 70% 5cm below the skin surface? 8:211

A. Chart 1
B. Chart 2
C. Chart 3
D. None of the above

14. The percent depth dose for a 12 x 12 cm field, 4 MV beam, 5 cm depth, and 80 cm SSD is 82.3. Calculate the percent depth dose for the same field size and depth for 100 SSD 8:168

A. 84.3%
B. 87.6%
C. 89.6%
D. 96.3%

15. Because large changes in x-ray energy are required for small changes of HVL, the quality of x-ray beam between 2-30 MeV shall be stated by its: 2:55

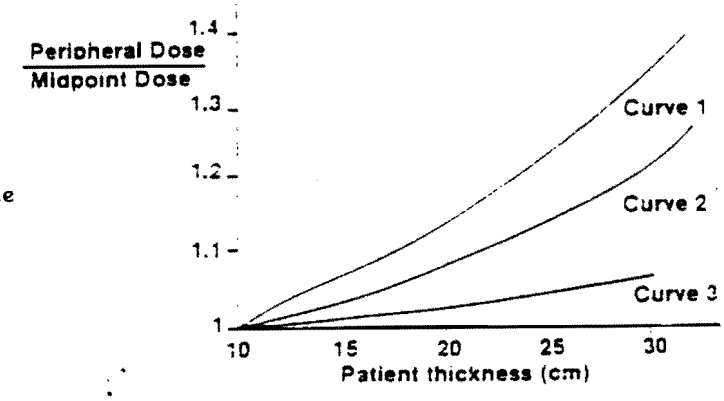
1. Absorption rate *2. Nominal peak* *3. T.A.R.*

A. 1 only
B. 2 only
C. 3 only
D. 1, 2, & 3

Pertaining to the ratio of maximum peripheral dose to midpoint dose, answer question 16.

16. The graph above is produced using parallel opposed fields. Which curve possesses the highest beam energy?

A. Curve 1
B. Curve 2
C. Curve 3
D. Unable to determine



17. Calculate the time necessary to deliver 180 cGy to the midplane of a patient 18cm thick using AP-PA Cobalt-60 fields. The percentage depth dose at 9cm is 62.5 and the backscatter factor is 1.034. The output is in air at the distance of Dmax 84.3 cGy/minute.

A. 1.65 minute
B. .88 minute
C. 3.30 minute
D. 3.44 minute

18. The representation of volumetric or planer variations in absorbed dose at different levels are depicted by means of: 8:205

A. Depth dose maximums
B. Mayneord's F factors
C. Central axis curves
D. Isodose curves

19. The tissue air ratio (T.A.R.) at the depth of maximum electron buildup (Dmax) is 9:169

1. Always less than or equal to 1 *2. The backscatter factor* *3. Dependent on the field size*

A. 1 & 2 only
B. 1 & 3 only
C. 2 & 3 only
D. 1, 2, & 3

20. An increase in field size will increase: 8:281

A. Electron emission from the collimator
B. Electron emission from the air
C. Dose in the buildup region
D. Skin sparing effect

21. The backscatter factor is effected by all of the following, except: 8:174

1. Treatment field size *2. Radiation quality* *3. Quantity of radiation*

A. 1 only
B. 2 only
C. 3 only
D. 1, 2, & 3

22. The concept of tissue-air ratio (TAR) is most commonly employed for calculations involving: 8:169

A. Overlapping fields
B. SSD varying fields
C. Separated fields
D. Opposed fields

23. The D max for a 4 MV photon beam at an 100cm SSD is approximately: 8:429

A. 1cm
B. 2cm
C. 5cm
D. 8cm

24. The use of radiographic film dosimetry in the measurement of isodose curves may possess acceptable accuracy (+/-3%) at photon energies of: 8:155

A. 150 KeV
B. 250 KeV
C. 500 MeV
D. 6 MeV

25. The f factor for a given energy is dependent upon the _____of the material: 8:125

A. Atomic number
B. Chemical bonding
C. Both of the above
D. Neither of the above

26. If a Co 60 unit is employed at a 80 cm. SSD for a 15cm x 15 cm field size and has a percentage depth dose of 58.4 at a 10 cm depth., what new PDD at this field size and the depth would be obtained for a 100 cm SSD? 3:26

A. 53.2
B. 56
C. 60.9
D. 65.3

27. The energy range for photon beams above 2 MeV should be measured by: 2:55

A. Half-value layers
B. Dosimetric films
C. Isodose data
D. End error tables

28. The amount of backscattering that occurs in a given treatment volume will increase as: 8:174

1. Field size increases *2 Beam quality increases* *3. D max increases*

A. 1 only
B. 2 only
C. 3 only
D. 1, 2, & 3

29. The quantity of radiation that is absorbed in a tissue (absorbed fraction) is dependent upon the: 8:73

1. Size of the organ *2 Energy of the beam* *3. Attenuation of the organ*

A. 1 & 2 only
B. 1 & 3 only
C 2 & 3 only
D. 1, 2, & 3

30. Adequate verification of isodose charts from the manufacturers is performed using a/an 8:209

A. Water phantom
B. Air-filled chamber
C. Styrofoam block
D. Lead screen

31. The depth of maximum ionization is most dependent on: 8:162

A. S.S.D.
B. Field size
C Beam energy
D. Thickness of tissue

32. All of the following are general properties of x and gamma ray dose distribution EXCEPT: 8:206

A. Near beam edge dose rate decreases rapidly
B. Near beam edge fall off due to geometric penumbra and reduced side scatter
C. Dose at any depth decreases toward beam edges
D. Dose at any depth is lowest on the central axis

33. The amount of backscatter at the depth of the dose maximum becomes negligibly small at beam energies above: 8:171

A. 500 KV
B. 4 MV
C. 8 MV
D. 20 MV

34. The scatter-air ratio (SAR) may be used in the determination of the scattered dose produced in:

1. Square fields *2. Irregular fields* *3. Circular fields*

A. 1 & 2 only
B. 1 & 3 only
C. 2 & 3 only
D. 1, 2, & 3

8:178

35. An isodose curve can be employed to obtain measurements of depth dose percentage as a function of the transverse distance from the: 8:205

A. Treatment source
B. Central axis
C. Tumor location
D. Horizontal axis

36. A dose of 5000 cGy is to be delivered at a depth of 8cm where the percentage depth dose is 60.3%. What is the dose to an underlying sensitive organ at a depth of 10cm where the percentage depth dose is 55.5%?

A. 2775 cGy
B. 3015 cGy
C. 4602 cGy
D. 5432 cGy

3:41

37. A lesion is treated using a 100 degree arc and the midpoint of the tumor volume is 8cm below the skin surface. The isocenter should be placed at: 8:228

A. 5cm
B. 6cm
C. 8cm
D. 11cm

38. The dosimetric or physical field is normally the distance intercepted by the _____ on a plane perpendicular to the beam axis at the stated source distance. 8:163

A. 10% isodose curve
B. 50% isodose curve
C. 70% isodose curve
D. 100% isodose curve

39. A 10 MV linear accelerator is employed at an 80 cm SSD. The location of the maximum dose is found at a depth of: 8:432

A. 0 cm
B. .5 cm
C. 1.5 cm
D. 2.5 cm

40. As the energy of the beam increases, the maximum dose: 8.162

A. Is closer to the skin surface
B. Is deeper into the tissue
C. Is inversely proportional to the energy
D. Fails off due to scatter spread

41. When verifying an isodose chart using a water phantom, the acceptable amount of deviation is considered to be _____ or less in depth up to 20cm. 8:209

A. 2%
B. 4%
C. 7%
D. 10%

42. Calculate the Dmax dose for a patient receiving 300 cGy/day for a single AP port to a depth of 8cm. The percentage depth dose is 69.3%. 8:188

A. 244 cGy
B. 294 cGy
C. 432 cGy
D. 476 cGy

43. Mayneord's F factor is of use when there is a change in:

A. Energy
B. %DD
C. SSD
D. TAR

44. Which of the following is an advantage of SAD treatment over SSD treatment? 8:267

A. Depth of tumor is unimportant
B. Increased percentage depth dose
C. Patient is not moved for treatment
D. Field size is variable

45. The backscatter factor depends on:

1. SSD *2. Beam quality* *3. Field size*

A. 1 & 2 only
B. 1 & 3 only
C. 2 & 3 only
D. 1, 2, & 3

46. The depth of maximum ionization is most dependent on: 10:199

A. SSD
B. Field size
C. Beam energy
D. Thickness of tissue

47. Which of the following parameters are necessary for dose calculations when using shielding blocks?

1. Blocked field *2. Collimator setting* *3. Depth of target*

A. 1 & 2 only
B. 1 & 3 only
C. 2 & 3 only
D. 1, 2, & 3

8:195

48. Because of its relatively flat energy response and higher precision, the most reliable isodose charts are measured by a/an: 8:207

A. TLD
B. Ion chamber
C. Radiographic film
D. Laser beam

49. Calculate the monitor units required to deliver 200 cGy to a depth of 10cm for a 6 MV accelerator. The TAR is .804 and the dose rate is cGy/monitor unit is 1.03 in air 3:31

A. 228 MU
B. 242 MU
C 262 MU
D. 277 MU

50. The region between the skin surface and the point of maximum dose is called the 8 162

A. Kerma region
B. Skin sparing region
C Scatter maximum
D Dose buildup region

51. The principal advantage of the use of a tissue air ratio is in its ability to remove the dependence upon the

A. Source-to-skin distance
B. Field size
C Percentage depth dose
D. Back scattered radiation

8:169

52. The percentage depth dose for a 10 MV beam 15cm x 15cm field size, 5cm depth and 80cm SSD is 91.8. Calculate the percentage depth dose for the same field size and depth for 100cm SSD 8 168

A. 81.5
B. 83.8
C 87 4
D 92.9

53. The ratio of the scatter dose at a given point in a phantom, to the dose in free space at that same point defines the: 8:178

A. Attenuation ratio
B. Backscatter factor
C. Axis to skin ratio
D Scatter to air ratio

54. The evaluation of percentage depth dose assumes the variation of beam intensity along the: 8:160

A. Horizontal axis of the beam
B. Isocenter of the beam
C. Central axis of the beam
D. All axes of the beam

55. The Clarkson method is useful in the determination of the scatter produced in: 8:178

A. Square fields
B. Rectangular fields
C. Circular fields
D. Irregular fields

56. The output of a Cobalt 60 teletherapy unit is 85 cGy/min. in air. Calculate the time necessary to deliver a midplane dose of 170 cGy at a PDD of 63 and a 1.11 backscatter factor. 3:32

A. 2.06 min.
B. 2.23 min.
C. 2.86 min.
D. 3.46 min.

57. If a Co 60 unit is employed at a 100 cm SSD for a 15 cm x 15 cm field size and has a percentage depth dose of 59.3 at a 10 cm depth, what new PDD is oabtained for the same field size and depth at an 80 cm SSD? 8:168

A. 64.7
B. 62.3
C. 56.8
D. 54.3

58. The D max for a 10 MV photon beam at an 100 cm SSD with a 15 cm x 15 cm field is approximately:

A. 2.5 cm
B. 4 cm
C. 7 cm
D. 10 cm

8:432

59. If a 10 MV photon unit is employed at an 80 SSD for a 15 cm x 15 cm field and the depth dose percentage at 10 cm depth is 74%, what new % DD is obtained at the same field size and depth for a 100 cm SSD?

A. 62.2
B. 68.1
C. 73.2
D. 76.5

8:168

60. The percent depth dose will increase as the: 8:210

A. Treatment port size decreases
B. Source-to-skin distance increases
C. Beam quality decreases
D. Lession depth increases

61. Calculate the dose at Dmax for a 300 cGy dose if the depth dose percentage is 96%. 8:161

A. 267 cGy
B. 288 cGy
C. 312 cGy
D. 324 cGy

62. Which of the following can be used to measure isodose charts? 8:207

1. Radiographic films 2. Ion chambers 3 Solid state detectors

A. 1 & 2 only
B. 1 & 3 only
C. 2 & 3 only
D. 1, 2, & 3

63. A method for correcting an isodose chart for contour irregularities is the: 8:252

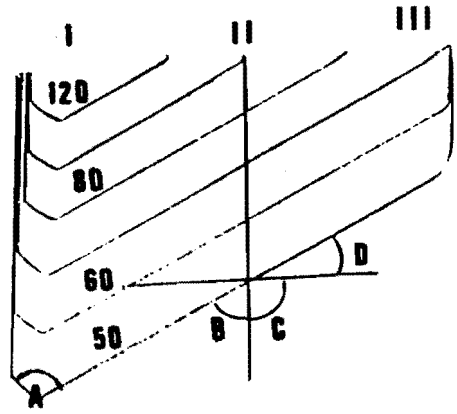
A. Impedance method
B. Field shaping method
C. Isodose shift method
D. Isocenter method

64. The ratio of dose at a given point in a medium to the dose at the same point in free space is called the:

A. Scatter air ratio
B. Tissue-air ratio
C. Tissue maximum ratio
D. Percent depth dose

3:29

Pertaining to the diagram, answer questions 65 and 66.



65. In the isodose curve for a wedged field, pick the letter that best corresponds to the angle of the wedge.

A. A C. C 8:213
B. B D. D

66. To obtain this tilt of the isodose curve the thin edge of the wedge is placed at the spot marked: 8:213

1. I 2. II 3. III

A. 1 only C. 3 only
B. 2 only D. 1, 2, & 3

67. The formula commonly employed for calculating maximum dose (D max) is: 8:161

A. Dmax = Dd/P x100 C. Dmax = Dd x P x 100
B. Dmax = P x 100 D. Dmax - do x dm xP

68. Which of the follwoing parameters effects the shape of an isodose curve? 8:210

1. SDD 2. SSD 3. Source size

A. 1 & 2 only C. 2 & 3 only
B. 1 & 3 only D. 1, 2, & 3

69. Calculate the dose at Dmax for a 300 cGy dose at depth, if the depth dose percentage is 75%. 8:161

A. 225 cGy C. 400 cGy
B. 275 cGy D. 525 cGy

70. The percentage depth dose for a 12 cm x 12 cm field, 4 MV beam, 5 cm depth and 80 cm SSD is 85.2. Calculate the percentage depth dose for the same field size and depth for 100 SSD. (Dmax = 1 cm)

A. 81.7% C. 86.8% 8:168
B. 83.6% D. 88.9%

71. Which of the following will have the same value as the backscatter factor? 4:67

A. TAR at Dmax C. TPR at Dmax
B. SAR at Dmin D. None of the above

72. Factors included in dosimetric computation are:

1. SSD/SAD 2. Field size 3. Beam modification

A. 1 & 2 only C. 2, & 3 only
B. 1 & 3 only D. 1, 2, & 3

73. If a Co 60 unit is employed at a 80 SSD for a 14 cm x 14 cm field size and has the percentage depth dose of 60.5 at a 10 cm depth, what is the new PDD at this field size and depth would be obtained at a 100 cm SSD? 8:168

A. 52.1 C. 58.0
B. 56.3 D. 63.1

74. Calculate the dose at Dmax for a 200 cGy dose if the depth dose percentage is 92% 8:161

A. 189
B. 197
C. 206
D. 217

75. Calculate the dose at Dmax for a 200 cGy dose and a percentage depth dose of 93%. :161

A. 186 cGy
B. 215 cGy
C. 234 cGy
D. 244 cGy