放射治療測驗

Radiotherapy

2019年8月25日星期日

1. 除題意不清楚或是圖片有問題，禁止詢問與試題有關的問題。

2. 應答時禁止使用任何文件。

3. 請在電腦答案卡上圈選作答

|  |  |
| --- | --- |
| **項目** | **填寫內容** |
| 姓名 | 您的中文與英文姓名 |
| 試題名稱 | RT Test |
| 項目 | 不用填寫 |
| 科目 | 不用填寫 |
| 受試者識別代碼 | 您的准考證號碼 25XXX  將您選定之數字的圓圈塗滿。 |
| 科目代碼 | 不用填寫 |
| 地點代碼 | 不用填寫 |
| 作答方式 | 本測驗共有90題問題。請使用1到90作答欄位。  請將測驗卷Q1的答案填入答案卷的答案選擇1。Q2 = 答案選擇2，Q3 = 答案選擇3…Q90 = 答案選擇90。 |

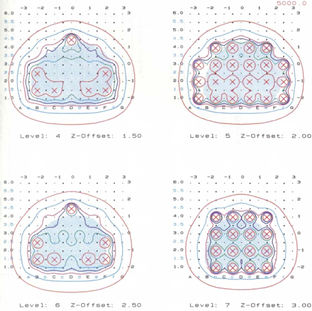
1. Which of the following is true about Window Width of CT Simulator?
2. If Window Width is extremely narrow, black and white of an image is clearly visible.
3. The wider the Window Width, the narrower the range of the CT values displayed.
4. The narrower the Window Width, the wider the range of the CT value displayed on the monitor.
5. If Window Width is wide, an image has high contrast and improved resolution.
6. If Window Width is narrow, an image has low contrast, and it can reduce the penumbra of the image.
7. Which of the following is true about the artifact of CT simulator?
8. Beam-hardening effect is caused by physical cause.
9. Beam-hardening effect is reduced if the thickness of the subject increases.
10. Cupping effect is that the CT value is higher in the middle than the surrounding.
11. Capping effect is that the CT value is higher in the surrounding than the middle.
12. To reduce beam-hardening effect, thin slice thickness or low tube voltage is used.
13. Which of the following is true about the noise increase of the image in CT simulation scan?
14. Noise increases proportionally to the slice thickness of the image.
15. Noise increases proportionally to the entrance dose of the subject.
16. Noise increases proportionally to the pixel size of the image.
17. Noise increases proportionally to the number of photon by the detector.
18. Noise increases proportionally to the attenuation of cross-sectional area through the subject.
19. Which of the following is directly related to the CT number (Hounsfield Unit)?
20. Attenuation coefficient
21. Slice thickness
22. Entrance dose
23. Pixel size
24. Tube voltage, tube current
25. Which of the following factors has the greatest effect on the resolution of CT simulation scan image?
26. Pitch
27. Filter
28. Pixel size
29. Slice thickness
30. CTDI
31. What is the effect of smaller FOVs with the same image matrix size in CT simulation scan?
32. The spatial resolution of the image is improved.
33. The contrast of the image gets worse.
34. The slice thickness of the image gets thick.
35. Beam hardening artifacts of the image decrease.
36. Partial volume artifacts of the image increase.
37. According to the Report No. 38 of ICRU, which of the following dose distinguishes HDR (High Dose Rate Brachytherapy) from LDR (Low Dose Rate Brachytherapy)?
38. 2 cGy/min
39. 20 cGy/min
40. 200 cGy/min
41. 20 cGy/hr
42. 200 cGy/hr
43. The following figure shows the arrangement of nuclide and dose distribution for brachytherapy of any site. Which of the following is correctly connected with the site, nuclide, and treatment?

Fig.1

1) Prostate - Ir-192 - (Semi)Permanent implant

2) Prostate – Ir-192 - Intraluminal irradiation

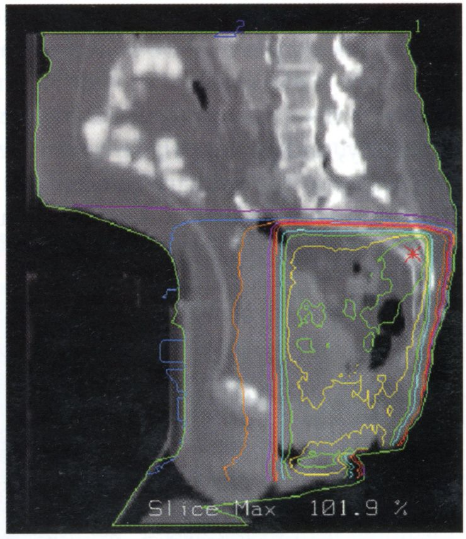
3) Prostate – I-125 - (Semi)Permanent implant

4) Uterus – Ir-129 – Intracavitary irradiation

5) Uterus – I-125 - Intracavitary irradiation

1. Which of the following treatments must place the (rotation) axis of the treatment beam in the body?
2. FSRT(Fractionated Stereotactic Radiotherapy)
3. TSEI(Total Skin Electron Irradiation)
4. CSI(Craniospinal Body Radiation Therapy)
5. SBRT(Stereotactic Body Radiation Therapy)
6. TBI(Total Body Irradiation)
7. SRS(Stereotactic Radiosurgery)
8. VMAT(Volumetric Arc Therapy)
9. a, b, c
10. b, c, d
11. a, b, f
12. c, d, g
13. b, c, e

Q10. The following image shows sagittal plane of the patient using belly-board. Which of the organs have benefit from using the device?

 Fig.2

1. Uterus
2. Bladder
3. Rectum
4. Small bowel
5. Both femoral heads
6. The following is an explanation of SBRT (Stereotactic Body Radiation Therapy). Which one is true?
7. SBRT needs to deliver the same dose to a lower MU compared to IMRT.
8. SBRT using protons is difficult to implement because RBE values are different.
9. SBRT can deliver the uniform dose to CTV compared to conventional 3D CRT.
10. SBRT uses stereotactic frame specially constructed for precision similar to SRS.
11. Compared to conventional 3D CRT, the goal of SBRT is to deliver less number of treatments and higher total doses.
12. Which of the following nuclides of seed type is available to delivery in brachytherapy?
13. Cobalt-60
14. Cesium-137
15. Iodine-125
16. Radium-226
17. Iridium-192
18. Which of the following parameter would increase treatment beam time in Tomotherapy?
19. Making field width wider
20. Raising modulation factor
21. Making the speed of gantry rotation faster
22. Raising Pitch(the speed of couch movement)
23. Using dynamic jaw function(using edge in superior-inferior) of Tomo Edge

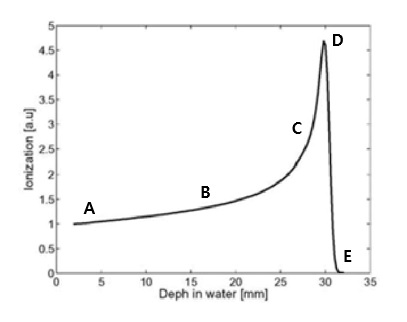
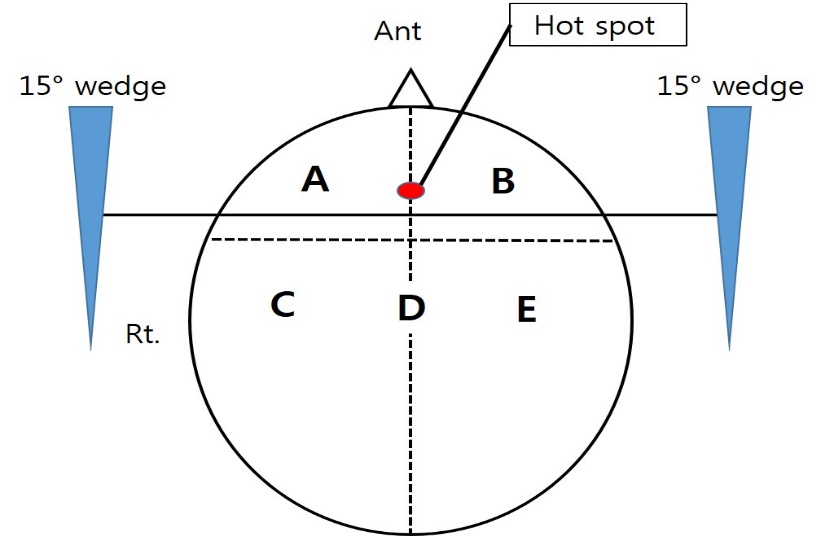
Q14. The following figure shows depth dose distribution of the proton. Choose the point that is associated with the lowest energy of the proton and the highest RBE (Relative Biological Effect)

Fig.3

1. A
2. B
3. C
4. D
5. E
6. Which of the following devices overlaps the Bragg-peak of the proton sequentially so that the proton can spread out widely and match with the volume of the tumor?
7. Degrader
8. Scanning magnet
9. Range Compensator
10. Energy Selection System
11. Range Modulator Wheel
12. Choose the correct angle for the accelerated electron to bend through the bending magnet before it hits the target in LINAC.
13. Chromatic 90 degree, Chromatic 180 degree bending magnet
14. Chromatic 90 degree, Achromatic 180 degree bending magnet
15. Chromatic 180 degree, Achromatic 270 degree bending magnet
16. Chromatic 180 degree, Achromatic 180 degree bending magnet
17. Chromatic 90 degree, Achromatic 270 degree bending magnet
18. Which of the following factors determines the angle of Dynamic Wedge Filter?
19. Dose rate
20. Moving speed of gantry
21. Changes in irradiation field size
22. Rates of irradiated MU mounts
23. Moving speed of collimation jaw
24. Which of the following is true about Tomotherapy?
25. It uses 10 MV X-ray in treatment.
26. It can use MVCT in IGRT.
27. It can use Cone Beam CT in IGRT.
28. The operation method of the MLC for IMRT is Window Sliding.
29. The latest one can implement gantry fixation treatment in table fixed.
30. Which of the following is true about Cyber-knife?
31. SAD is 100 cm
32. It uses MLC of Gimbaled.
33. It can use CBCT for image acquisition
34. It can treat various parts by using isocentric method.
35. It can implement tumor-tracking radiation therapy by using synchrony respiratory tracking system..
36. Which of the following systems can integrate CT imaging system with LINAC to determine the precise location of the tumor?
37. BAT
38. ANZAI
39. CBCT
40. Brainlab Exactrac
41. Calypso imaging system
42. Which of the following is the calculation algorithm using in Cyber-knife?
43. Acuros
44. AAA calculation
45. Monte Carlo calculation
46. Pencil Beam calculation
47. Superposition-convolution algorithm
48. Choose the correct component that is mainly used for the ion chamber of LINAC
49. High atomic number material
50. Low atomic number material
51. Tungsten
52. Lead
53. Platinum
54. What is the advantage of lung cancer's respiratory gated radiation therapy?
55. Reduced treatment time
56. Reduced therapeutic range
57. Improvement of target dose range
58. Reduced movement of tumor
59. Increased reproducibility of patient positioning
60. As defined in the ICRU-62 report, what are a and b in an equation of a = b + IM (internal margin)?
61. a-CTV, b-GTV
62. a-CTV, b-ITV
63. a-ITV, b-CTV
64. a-ITV, b-GTV
65. a-PTV, b-CTV
66. Which of the following is true about Hyper-fraction?
67. Total exposure dose decreases.
68. Dose per fraction is 180-200 cGy.
69. Dose per fraction is 500-600 cGy.
70. Total exposure dose and the period of treatment decrease
71. Total exposure dose increases but the period of treatment and the late complication do not increase.
72. What is the chemical factor that affects radiation response?
73. Oxygen
74. Cell Cycle
75. The quality of radiation
76. Dose rate of radiation
77. fractionated irradiation of radiation
78. What is the typical tumor marker test for prostate cancer?
79. AFP
80. CEA
81. DRE
82. PSA
83. CA19-9
84. Which cancer is marked as FIGO staging system?
85. Bladder cancer
86. Breast cancer
87. Pancreatic cancer
88. Thyroid cancer
89. Uterine cervix cancer
90. What is the maximum dose limit of the pacemaker compared to the treatment total dose as defined in the AAPM Task Group report 34?
91. Not more than 0.1 Gy
92. Not more than 0.2 Gy
93. Not more than 1.0 Gy
94. Not more than 2.0 Gy
95. No limit dose
96. What is the most common metastatic part of Ewing’s sarcoma?
97. Lung
98. Liver
99. Breast
100. Prostate
101. Pancreas
102. What are the most important predictive factors in breast cancer?
103. The size of tumor
104. The location of tumor
105. The number of tumor
106. Metastasis
107. The number of axillary lymph node invasion
108. What the dose uniformity of treatment target is defined in ICRU-50 report?
109. +3%~-3%
110. +3%~-5%
111. +5%~-3%
112. +5%~-7%
113. +7%~-5%
114. Where does the Hot spot move when the right wedge filter changes to 45 degrees in the following treatment plan?

 Fig.4

1. Part A
2. Part B
3. Part C
4. Part D
5. Part E
6. What is the position of axillary lymph nodes 2nd level in the image?



Fig.5

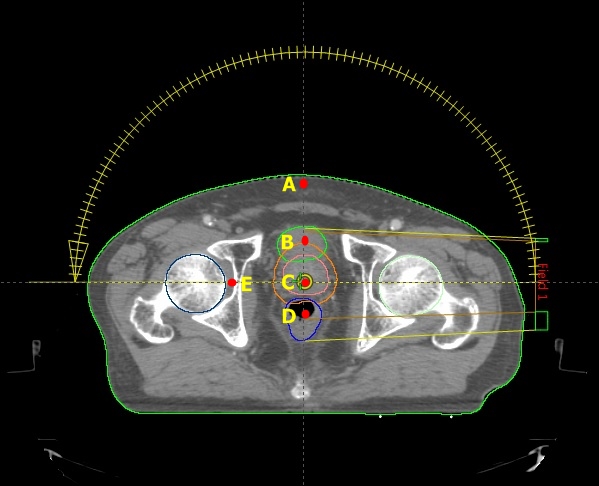
1. A
2. B
3. C
4. D
5. E
6. Which one is the maximum dose point in the following treatment planning image?

Fig.6

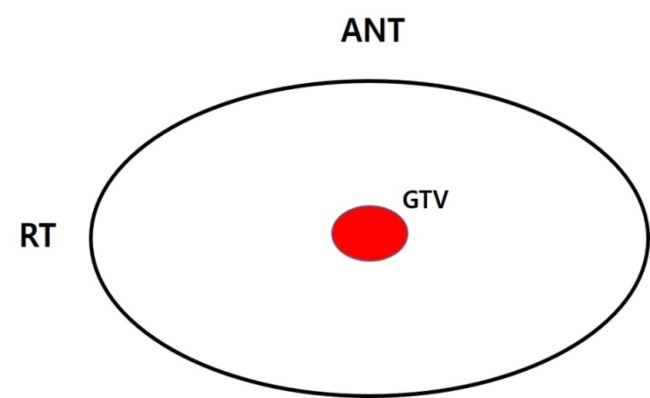
1. A-point
2. B-point
3. C-point
4. D-point
5. E-point
6. What is the treatment that has the least integral-dose for treating GTV in the image?

Fig.7

1. 180 degree Arc
2. Opposing portal irradiation(AP & PA)
3. Opposing portal irradiation(Rt. lat & Lt. lat)
4. Four portal irradiation(AP & PA & Rt. lat & Lt. lat)
5. Four portal irradiation(Four oblique)
6. Which of the following is true about the surface dose?
7. The proton beam is higher than the electron beam.
8. As the energy of electron beam increases, it decreases.
9. As the size of the irradiation field increases, it decreases.
10. It has nothing to do with the energy and is the result of the forward scattering.
11. As incidence angle increases in the oblique incidence, it increases.
12. Which of the following is true about SAR (Scatter Air Ratio)?
13. No related to field size
14. No related to SSD(Source Skin Distance)
15. No related to Photon Energy
16. Useless in irregular treatment field
17. Dose ratio of Max dose point in phantom
18. Which one is unnecessary extra treatment in TSEI (Total Skin Electron Irradiation)?
19. Sole
20. Palm
21. Vertex
22. Axillar
23. Perineum
24. Which of following dose rate (cGy/min) in low dose TBI (Total Body Irradiation, 3~5 fraction/week)?
25. 5~15
26. 30~40
27. 90~100
28. 100~120
29. 150~170
30. ( ) has the lowest integral dose of lung in breast cancer radiation treatment.
31. SRS technique
32. IMRT technique
33. VMAT technique
34. Wedge technique
35. Arc rotation technique
36. Which of the following depends on SSD (Source Skin Distance)?
37. TMR
38. TAR
39. BSF
40. SAR
41. PDD
42. Which of the following adequate electron beam energy to treat tumor in 3 cm depth?
43. 6 MeV
44. 9 MeV
45. 12 MeV
46. 16 MeV
47. 20 MeV
48. AAPM TG-40 recommends which of the following for Monthly QA of Simulator?
49. Exposure rate
50. Field size indicator
51. Cross hair centering

4) Focal spot axis indicator

5) Light / radiation field coincidence

1. Where is Malignant Melanoma most commonly found?
2. Arm
3. Face
4. Sole
5. Palm
6. Calf
7. Which one is commonly risk factor to be taken the liver cancer?
8. Sex
9. Age
10. Alcohol
11. B Hepatitis
12. C Hepatitis
13. Which of the following does not ionize directly?
14. Positron
15. Neutron
16. Alpha particle
17. Proton
18. Electron
19. What material made of flattening filter?
20. Zinc or Copper
21. Inert materials
22. Low Z material
23. Lead or tungsten
24. Equivalent material
25. Calibration of a machine primarily deals with:
26. Mechanical parameters
27. Digital displays
28. Laser equipment

4) Radiation beam parameter

5) All of the above

1. Which of the following is not an accelerator component?
2. Waveguide
3. Transducer
4. Circulator
5. Modulator
6. Thyratron
7. Which of following sources are accelerating power in linear accelerator?
8. Klystron and magnetron
9. Thyratron and electron gun
10. Magnetron and electron gun
11. Bucher and Pre-buncher
12. Bending magnet and collimator
13. Which of the following is the clinical RBE of proton?
14. 0.9
15. 1.0
16. 1.1
17. 1.2
18. None of the above

1. Which of following software application is the current communication standard for the transfer of imaging data between?
2. NEMA
3. ACR
4. IHE
5. MITA
6. DICOM
7. DICOM-RT is the standard for the transfer of all of the following EXCEPT:
8. RT structure sets
9. RT images
10. RT optimization parameters
11. RT plans
12. RT dose
13. How many tenth-value-layer must be added to the secondary barriers in a vault if the number of monitor units per treatment on a LINAC increases by a factor of five but the dose rate behind the barrier must remain the same?
14. 0.1
15. 0.4
16. 0.7
17. 1.4
18. 2.1
19. Which of the following is not part of a diagnostic X-ray machine?
20. Filament
21. Transformer
22. Target
23. Rectifier
24. Buncher
25. Compton-scattered electrons can be emitted at with respect to the direction of the incident photon.
26. 0°–90°
27. 30°-110°
28. 90°-180°
29. 0°-270°
30. None of the above
31. According to the ICRU, Which of the following represents the expansion for an organ at risk, analogous to the PTV expansion for a target?
32. OAR
33. IM
34. SM
35. PRV
36. EUD
37. Choose the correct answer that defines the mechanical isocenter.
38. Center of treatment field
39. Point where the lasers intersection
40. Point defined by star shot taken at different gantry angles
41. Normalization point
42. Point of intersection of the couch, collimator, and gantry axes of rotation
43. A field of collimator setting 8 x 30 cm has an equivalent square of cm.
44. 10.5
45. 12.6
46. 19
47. 22.4
48. 25
49. Which of following imaging modality for target localization in Cyber-knife?
50. Cone beam CT
51. OBI
52. Portal vision image
53. Ultrasound
54. Orthogonal X-ray
55. A 10 x 10 cm 16 MeV electron beam has 90% depth dose at about cm.
56. 1.5
57. 3
58. 5
59. 8
60. 10
61. Choose the correct answer that the commonly material for neutron shielding in treatment room door.
62. Paraffin Wax
63. Concrete
64. Lead
65. Tungsten
66. Borated polyethylene
67. Which of the following isotope is the most commonly used in PET imaging?
68. 15F
69. 18F
70. 127I
71. 11C
72. 60Co
73. Choose the correct answer that presents a Sievert Unit.
74. Exposure
75. Equivalent dose
76. Absorbed dose
77. Dose rate
78. Monitor Unit
79. Which of the following chemical species is responsible for causing approximately two-thirds of the damage through the indirect action of X-ray?
    1. ㆍOH
    2. H3O+
    3. OHㆍ
    4. Hㆍ
    5. H+
80. The reason why a beam spoiler is used in a photon beam to
81. Decrease the skin dose by filtering out electron scatter
82. Decrease the PDD at the prescribe depth
83. Increase the skin dose, but decrease dose in the build-up region
84. Decrease the effective photon energy
85. Increase dose in the build-up region while maintaining some skin sparing
86. For calculating room shielding, the use factor, U, refers to
87. The weekly dose at the isocenter
88. The fraction of operation time that area in question is occupied
89. The fraction of operation time that the beam is directed towards the barrier
90. The fraction of the workweek that machine in in operation
91. Summation MUs per a day
92. What is the CT number in a CT image?
93. Of a material is dependent on linear attenuation coefficient
94. Increases if the window width is increased
95. Decreases if the window width is decreased
96. Increases with mAs
97. No matter with linear attenuation coefficient
98. For a radiation worker, such as a nuclear medicine physician or radiologist, the maximum permissible effective dose is mSv/year.
99. 5
100. 10
101. 15
102. 50
103. 500
104. KERMA is the :
105. Energy per unit mass transferred from charged particles.
106. Energy per unit mass absorbed or retained along the path of charged particle.
107. Energy per unit mass transferred from photons to charged particles.
108. Charge released by photons as they pass through a specified amount of air
109. Charge released by photons as they pass through a specified amount of tissue
110. TMR(Tissue Maximum Ratio) depends on:
111. Energy, SAD, Depth and field size
112. Energy, SAD, Field size
113. SAD, Depth and field size
114. Energy, Depth and field size
115. SAD only
116. Choose the range of typical residual positioning error after image registration for treatment.
117. 1~2 cm
118. 0.5~1 cm
119. 1~5 mm
120. <5 cm
121. None of all above
122. Prior to radiation treatment, the dose received at isocenter by cone beam CT is approximately cGy.
123. 20~40
124. 10~20
125. 2~4
126. 0.2~0.4
127. 0.02~0.04
128. Choose the true answer about total body irradiation (TBI).
129. Only used electron
130. In certain orientations, tissue compensators are necessary
131. 4 directions (AP/PA, bilateral) can be used
132. Lung doses are unlimited for treatment
133. All of above
134. Which of following tool is comfortable for measure skin dose?
135. 99% pure Gel
136. Film
137. MOSFET
138. TLD
139. Glass dosimeter
140. Which one is for delivery homogeneous dose distribution on broad field in X-ray treatment?
141. Carousel
142. Collimator
143. Jaw
144. Monitoring chamber
145. Flattening filter
146. Which is correct answer that the merit of MVCT more than KVCT?
147. Less absorbed dose
148. Better low contrast resolution
149. Higher image quality
150. Remark artifacts by high atomic number materials
151. Reduced metal artifact
152. Which angle wedge is inserted to 120o two portal beams for Thymoma?
153. 15
154. 30
155. 45
156. 60
157. None of all above
158. Hyper-fractionation radiation therapy is related to ( ), ( ) in 4R.
159. Redistribution, Repopulation
160. Repopulation, Reoxygenation
161. Redistribution, Reoxygenation

4) Repair, Repopulation

5) Repair, Redistribution

1. Which one is acute damage of radiation therapy?
2. Production of cancer
3. Blister
4. Cataract
5. Radiation Sickness
6. Hereditary effect
7. What material is commonly composed of thermoluminescence?
8. CaSo4
9. CaF2
10. LiF
11. Li2B
12. Li3B
13. With megavoltage film dosimetry, isodose curves can be measured to within:
14. ±10%
15. ±7%
16. ±5%
17. ±3%
18. ±1%
19. A consistency check of radiation beam should be performed at least:
20. Daily
21. Weekly
22. Monthly
23. Quarterly
24. Annually
25. A monitor unit in a LINAC usually represents an absorbed dose of :
26. 1 Gy
27. 0.01 Gy
28. 0.05 Gy
29. 100 Gy
30. 0.1 Gy
31. Which of the following is listed in the correct order from smallest to largest according ICRU definitions:
32. GTV, ITV, CTV, PTV
33. ITV, CTV, GTV, PTV
34. GTV, CTV, ITV, PTV
35. PTV, ITV, CTV, GTV
36. GTV, CTV, PTV, ITV
37. Proton plans compared to photon plans are typically conformal and uniform.
38. More, more
39. More, less
40. Less, more
41. Less, less
42. More, equal
43. The penumbra of proton beams is :
44. Larger at small depths and smaller at large depths
45. Smaller at small depths and larger at large depths
46. Independent of depth
47. Always sharper than photons
48. None of all above
49. Which of the following is true of annual QA for a linear accelerator?  
    1) Accuracy of MLC position  
    2) Indicator of gantry position  
    3) Coincidence of light and radiation field size  
    4) Coincidence of an X-ray beam quality (PDD10 or TMR1020)  
    5) Optical distance indicator (ODI) check

Q90. Acceptable error of source position accuracy in daily QA of brachytherapy is:

1) 0.5 mm

2) 1.0 mm

3) 1.5 mm

4) 2.0 mm

5) 2.5 mm