放射治療測驗

Radiation Therapy

2023 年 8 月 27 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 23XXX 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 80 題問題。請使用 1 到 80 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 statement about Planning Target Volume (PTV) is correct?
    1. 50% isodose distribution area
    2. Area containing 20-80% isodose
    3. Volume in which tumor cells are observed microscopically
    4. Volume confirmed by visualization and palpation
    5. A volume that considers setup variation and measurement error

2. What is the main reason for dose inequality in total body irradiation (TBI) treatment?
    1. Long SAD
    2. Patient position
    3. Patient thickness difference
    4. Use of compensator
    5. Use of beam spoiler

3. Which of the following can reduce skin dose in treatment planning?
    1. Reduce the irradiation area.
    2. Reduce SSD
    3. Use proton beam
    4. Use higher energy for electron beam.
    5. Use lower energy for photon therapy.

4. Which statement is true of integral dose?
    1. Total dose received by the patient.
    2. Total dose absorbed by the tumor tissue.
    3. Total dose absorbed by the iso-center.
    4. Total dose excluding the dose absorbed by normal tissue.
    5. IMRT has a higher integral dose than VMAT.

5. Which type of ionizing radiation uses indirect effects in radiation therapy?
    1. Alpha, X-ray, Gamma
    2. X-ray, Gamma, Proton
    3. X-ray, Gamma, Neutron
    4. Proton, Neutron, X-ray
    5. Alpha, Proton, Neutron

6. Which of the following cancers in humans is considered less sensitivity to radiation?
   1. Fibrosarcoma
   2. Malignant Lymphoma
   3. Neuroblastoma
   4. Wilms' tumor
   5. Hodgkin's disease

7. Which of the following is a characteristic of high-LET radiation?
   1. Lower OER (Oxygen-Enhancement-Ratio)
   2. Used for treating hypoxic cells
   3. High dependence on cell cycle
   4. X-rays and gamma rays
   5. The therapeutic ratio is high when OER increases.

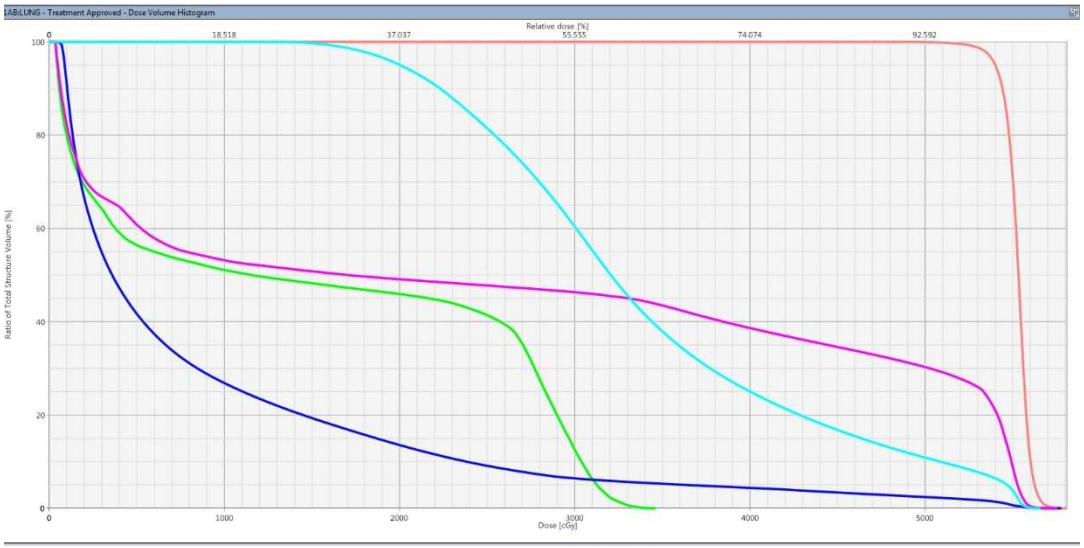
8. What is the energy loss rate of electron beam in clinic?
   1. 0.5 MeV/cm
   2. 1.0 MeV/cm
   3. 1.5 MeV/cm
   4. 2.0 MeV/cm
   5. 3.0 MeV/cm

9. Which of the following devices evaluates the flatness and symmetry of a radiation b eam in a linear accelerator
   1. Target
   2. Ion chamber
   3. Compensator
   4. Flattening filter
   5. Collimator

10. The cervical lymph node located in a 3cm deep will be treated with an electron be am. What is the energy required that covers the range of 90%?
   1. 4-6 MeV
   2. 7-9 MeV
   3. 10-12 MeV
   4. 13-15 MeV
   5. 16-18 MeV

11. What are the advantages of MVCT over KVCT for imaging in radiotherapy?
    1. Low exposure dose to patient
    2. Better soft tissue contrast
    3. Faster image acquisition time
    4. Fewer artifacts from high atomic number materials
    5. Use of the same iso-center as treatment

12. The diagram below is a tool commonly used for evaluation of radiation treatment pl an. Which statement is true about the information provided by this tool?



    1. Daily dose
    2. Location of the tumor
    3. Cell survival curve of normal tissues
    4. Radiation therapy modalities used in the treatment plan
    5. Conformity Index of the tumor volume to the prescribed dose

13. Which of the following is the most effective way to improve the image quality of DRRs generated from radiation treatment planning system?
    1. Increase the contrast bolus.
    2. Hold the patient's breathing while taking CT scan.
    3. Set a thinner slice thickness for CT scan
    4. Generate the DRRs at a low magnification.
    5. Use an immobilization device that has less impact on image reconstruction.

14. Which statement about Klystron and Magnetron is correct?
    1. Deflecting an electron beam.
    2. Adjusting the focus in a line.
    3. Located in the head of a linear accelerator.
    4. Generating high frequency (microwave) waves.
    5. Accelerates electrons to produce high radiation energy.

15. Why uses a beam spoiler when performing total body irradiation (TBI)?
    1. Reducing Lung dose
    2. Reducing the "horn effect" of the beam
    3. Improving PDD in the patient's mid-plane
    4. Reducing electron contamination
    5. Increasing dose in the build-up region

16. Which of the following is NOT a consideration for IMRT planning?
    1. Dose weight
    2. Beam arrangement
    3. Segments
    4. Upper and lower constraints
    5. Number of beams

17. Which statement about the Flattening Filter Free (FFF) technique is true?
    1. More scatter dose
    2. Less neutron generation
    3. More flattened dose distribution
    4. Longer treatment time
    5. Lower dose rate

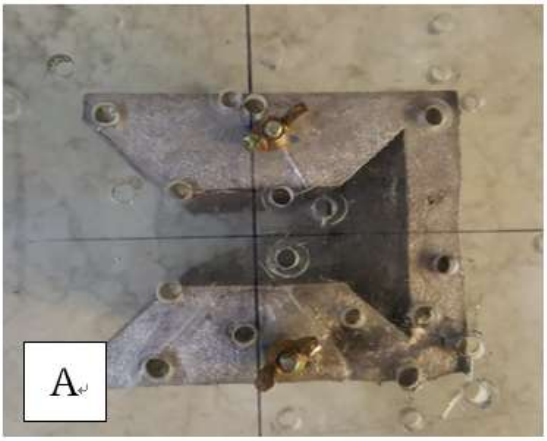
18. Which of the following is the correct pairing of each radiation detector for its inten ded use?
    1. Diode detectors - measuring the absolute dose of photons
    2. Diamond detector - absolute dose measurement of electron beams
    3. Parallel Plate ion chamber - measuring the cross-sectional dose of photons
    4. Semiconductor detector - measuring the output dose of photons and electrons
    5. Farmer type ion chamber- output dose measurement of photons and electrons

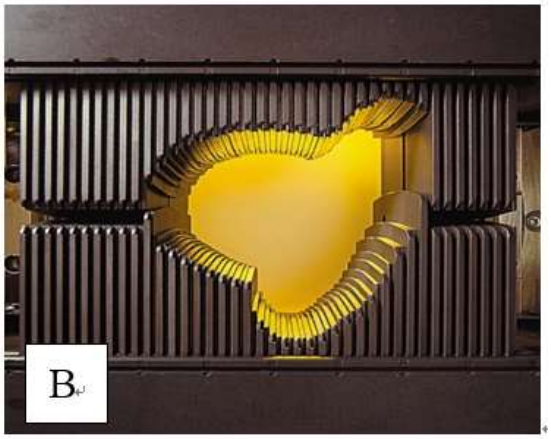
19. What is the main difference between the intensity-modulated radiation therapy (IMRT) treatment techniques "step and shoot" and "sliding window"?
    1. The sliding window does not use MLC.
    2. Only the step and shoot has inverse planning.
    3. The step and shoot technique generates more neutrons.
    4. The step and shoot has more MUs than Sliding Window.
    5. The sliding window method continuously changes the dose intensity.

20. Which of the following is true about the picture below?

    1. Tumor staging
    2. 3D image acquisition
    3. Acquisition of fluoroscopic images
    4. Calculation of patient's treatment dose
    5. Treatment outcome and prognosis prediction

21. Which of the following is true about the picture below?





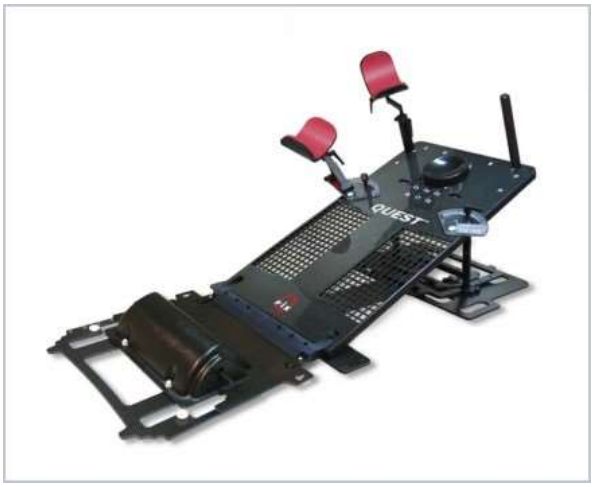
1. B is mainly made of lead (Pb).
2. B has a longer production time than A.
3. A is a customizable electron beam block aperture
4. B has a large penumbra, but allows for precise shielding.
5. B is essential component for intensity-modulated radiation therapy.

22. Which of the following is true related to the picture below?

1. Specialized in making compensator.
2. Specialized in making electron block aperture.
3. The machine setting varies depending on linear accelerator type..
4. The location of the Styrofoam is different depending on the energy,
5. The location of the shadow tray and the Styrofoam must be on the same position.

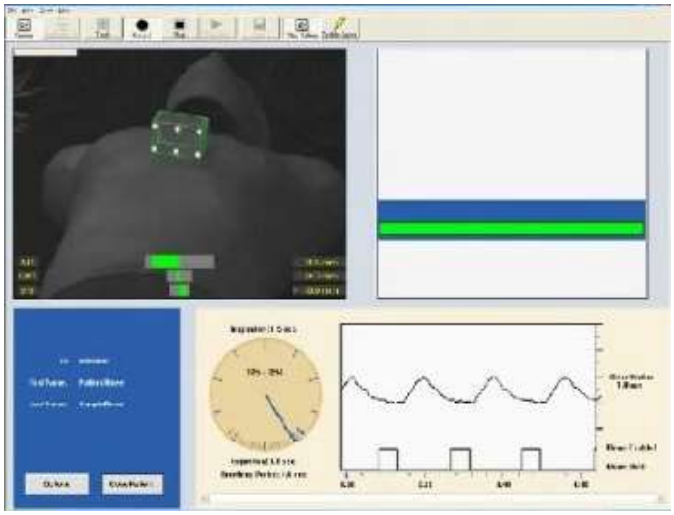
23. What is the main purpose of performing a four-dimensional CT-simulation?
1. Respiratory signal of patient
2. Reduction of treatment time
3. Correction for target inhomogeneity
4. Intensity modulation of radiation source
5. Uneven dose compensation of the target

24. Which anatomical site is best suited for the application of the following devices?



1. Brain cancer
2. Breast cancer
3. Stomach cancer
4. Pancreatic cancer
5. Head and neck cancer

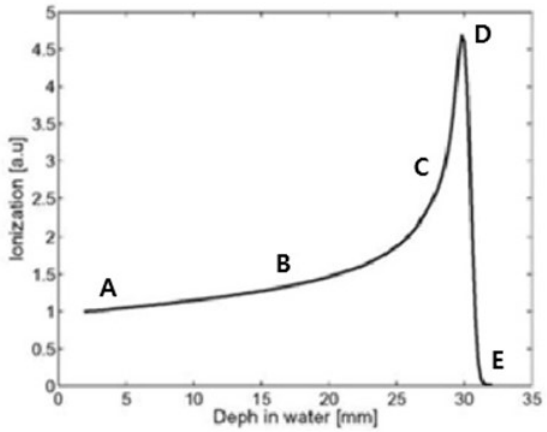
25. Choose the correct explanation for the diagram below.



1. Used for brain radiosurgery
2. The program is mainly used for simulating head and neck cancer.
3. The program can automatically compensate for unstable breathing.
4. The simulation needs to be performed while the patient is not breathing.
5. For accurate treatment, it is necessary to train the patient in breathing before ta king images.

26. In electron therapy, select the correct sequential combination of electron pathways from the electron gun to the patient's skin surface.
    1. Scattering foil – ion chamber – electron block – electron cone – bolus
    2. Scattering foil – ion chamber – electron cone – bolus – electron block
    3. ion chamber – scattering foil - electron cone – electron block – bolus
    4. Scattering foil – ion chamber – electron cone – electron block – bolus
    5. ion chamber – electron cone – scattering foil - electron block – bolus

27. The graph below is a representation of the proton's PDD curve. Choose the point where the highest RBE (relative biological effect) occurs.



    1. A
    2. B
    3. C
    4. D
    5. E

28. Which of the following best describes the characteristics of an electron therapy?
    1. Difficult to shield compared to X-rays.
    2. Effective treatment for deep-seated cancers
    3. The higher the energy, the higher the surface dose
    4. Dose distribution can be improved by using a wedge filter.
    5. The integral dose is larger than X-ray due to limited penetration.

29. Which of the following imaging modalities delivers the lowest dose to the patient?
    1. kVCT
    2. MVCT
    3. kV-CBCT
    4. Orthogonal kV pair
    5. Orthogonal MV pair

30. Which of the following is a factor that determines the angle of a Dynamic Wedge filte r?
    1. Dose rate
    2. Raito of MU delivered
    3. Gantry movement speed
    4. Movement speed of the Jaw
    5. Change in irradiation field size

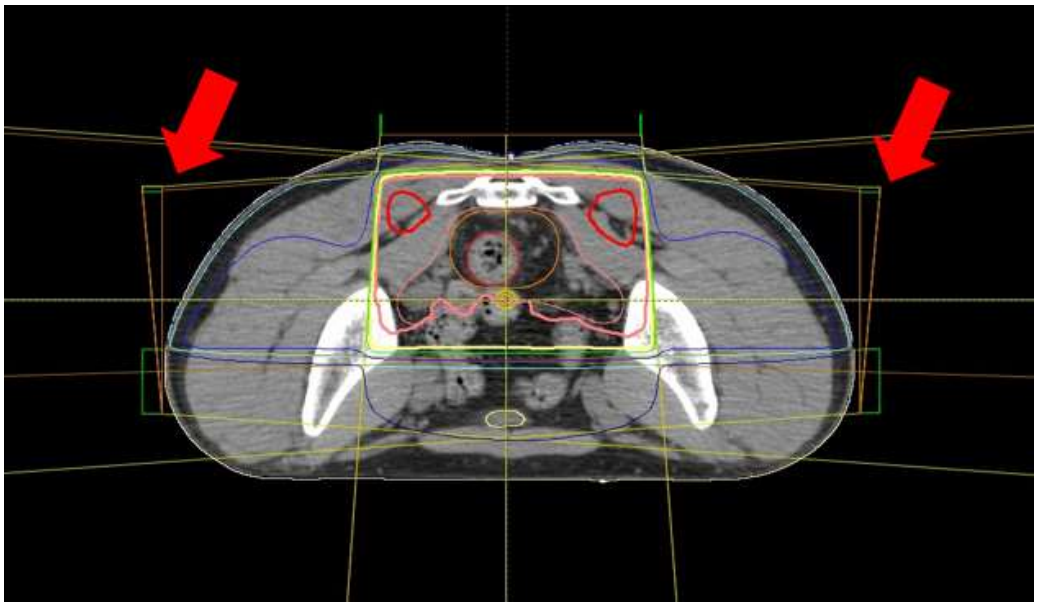
31. Which statement about the picture below is correct?

    1. Treating with 10 MV X-ray only
    2. IGRT can be performed using MVCT.
    3. Maximum field size is up to 40 * 40 cm^2
    4. CBCT provides faster image acquisition time
    5. The window sliding method is used for IMRT

32. What is the benefit of respiratory-gated radiation therapy for lung cancer?
    1. Reduced treatment time
    2. Reduced irradiation volume
    3. Reduced normal tissue motion
    4. Improved target dose coverage
    5. Increased reproducibility of patient positioning|

33. What chemical factors affect radiation response?
    1. Oxygen
    2. Cell cycle
    3. Dose Rate
    4. Fractionation
    5. Radiation beam quality

34. Which statement is true about the radiation therapy aid represented by the arrow in the diagram below?



    1. It is used to increase the surface dose.
    2. It is used to create an even radiation dose distribution.
    3. Material is mainly brass and is customized for each patient.
    4. It is a tool that is attached to the patient's body during radiation therapy.
    5. It is more commonly used for electron radiation therapy than photon radiation.

35. What is the maximum dose limit for pacemakers as defined by AAPM Task Group report -34 (relative to total therapeutic dose)?
    1. 0.1 Gy or less
    2. 0.2 Gy or less
    3. 1.0 Gy or less
    4. 2.0 Gy or less
    5. No dose limit

36. What is the dose uniformity of the treatment target, as defined by the ICRU-50 report?
    1. +3% to -3
    2. +3% to -5
    3. +5% to -3
    4. +5% to -7
    5. +7% to -5

37. Which of the following applies to the quality assurance of a Simulator?
    1. Energy
    2. Timer system
    3. Timer accuracy
    4. Output stability
    5. Image quality of the fluoroscopy

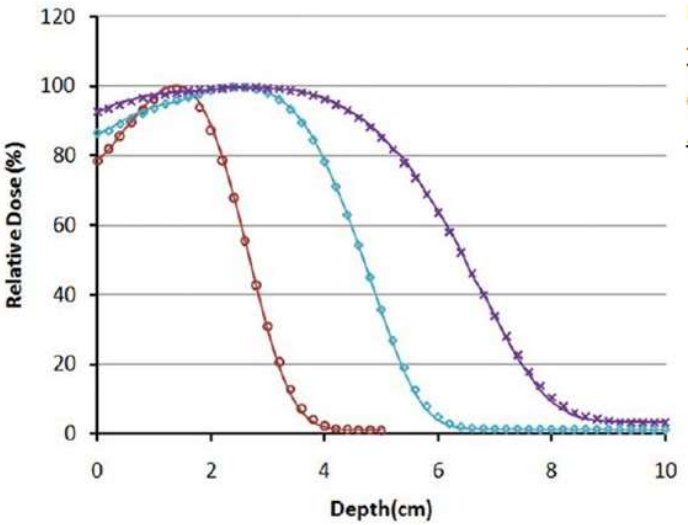
38. What is the temperature and air pressure of the reference measurement condition when measuring output dose in QA?
    1. Temperature: 20 ℃, air pressure: 740 mmHg
    2. Temperature: 20 ℃, air pressure: 760 mmHg
    3. Temperature: 22 ℃, air pressure: 740 mmHg
    4. Temperature: 22 ℃, air pressure: 760 mmHg
    5. Temperature: 22 ℃, air pressure: 780 mmHg

39. Which is the correct for daily checklist in a linear accelerator?
    1. Output calibration
    2. Rotational axis Accuracy
    3. X-ray flatness and symmetry
    4. Door open/close operation of treatment room
    5. Coincidence check between light field and radiation field

40. Which of the following statements is true about the Cyber Knife?
    1. SAD is 100cm.
    2. Gimbaled MLC is used.
    3. Image acquisition is performed by CBCT.
    4. Real-time tumor tracking system is available
    5. Iso-centric method can be used to treat brain tumor

41. Which of following IGRT devices is NOT attached to the gantry and is installed separately?
    1. ExacTrac
    2. Helical CT(Tomotherapy)
    3. OBI(On-Board Imager)
    4. KV CBCT(Cone Beam CT)
    5. MV CBCT(Cone Beam CT)

42. The following graph shows the PDD curves for each energy of a certain radiation. Which treatment techniques using this radiation is correct?

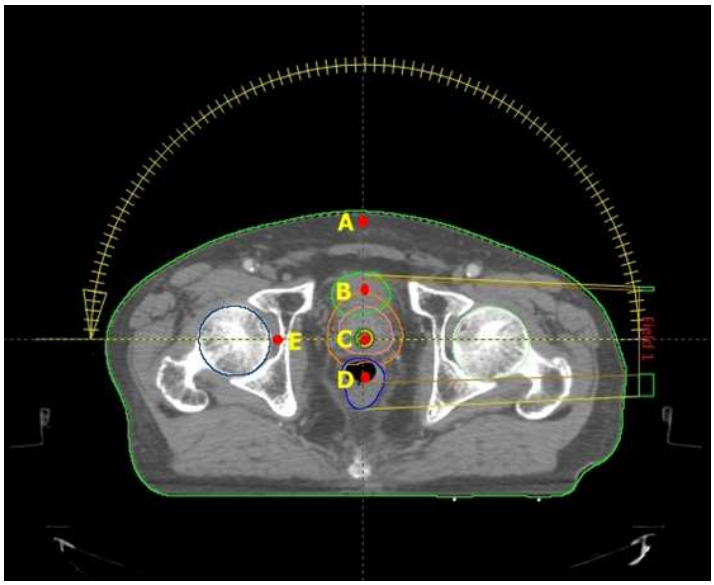


    1. TBI(Total Body Irradiation)
    2. 4D respiratory-gated delivery
    3. SRS(Stereotactic Radio Surgery)
    4. TSEB(Total Skin Electron Beam therapy)
    5. IMPT(Intensity Modulated Proton Therapy)

43. The picture below describes an object that is inserted into the body during the treatment of prostate cancer with intensity-modulated radiation. Which of the following is a correct statement?

1. Reducing bladder dose in order to decrease post-treatment side effects.
2. Reducing the rectal wall dose in order to decrease post-treatment side effects.
3. Air-filling provides better target coverage than water-filling in dosimetrical aspect
4. Injecting less than 60 cc is highly recommended to avoid anatomical deformation.
5. Semi-permanently inserted into patient's rectum over the whole course of treatment.

44. What is the location of the maximum dose point in the following treatment planning image?



1. Point A
2. Point B
3. Point C
4. Point D
5. Point E

45. Which dosimeter is used for brachytherapy QA?
    1. TLD
    2. Diode dosimeter
    3. Well-type chamber
    4. Parallel plate chamber
    5. Farmer type chamber

46. In a linear accelerator, a pressurized, sealed ion-chamber is being used for dosimetry. If the ion-chamber slowly leaks, which statement about the change in output (cGy/MU) of the linear accelerator is correct?
    1. No change
    2. Decrease rapidly.
    3. Slowly increasing
    4. Slowly decreasing
    5. Rapidly increasing

47. Which of the following components of a linear accelerator does NOT require cooling system?
    1. Target
    2. Klystron
    3. Magnetron
    4. Electron gun
    5. Bending magnet

48. Which of the following is directly related to the CT number or Hounsfield number?
    1. Physical density
    2. Electron density
    3. Stopping power
    4. Effective atomic number
    5. Linear attenuation coefficient

49. Which of the following best represents soft tissue in a radiation treatment plan?
    1. CT
    2. MRI
    3. SPECT
    4. X-ray
    5. CBCT

50. Which of the following method is correct for reducing the geometric penumbra?
    1. Increases the source-to-skin distance
    2. Increases the collimator-to-skin distance
    3. Increases the source-to-collimator distance
    4. Produces the block aperture perpendicularly
    5. Uses MLC instead of customized block aperture

51. What defines a field size for SSD technology?
    1. D_{max}
    2. Patient surface
    3. Central rotation point
    4. Where the film/detector is placed
    5. Central point of patient thickness (Mid-sparation)

52. Which of the following is true of isodose curve?
    1. not used for a prescription of treatment planning
    2. it is the curve by connecting points of the same PDD
    3. no information about the size of penumbra from the isodose curve
    4. Film isodose curve plotter mainly uses non-tissue-equivalent materials
    5. no need to be consistent of beam quality when drawing the isodose curve

53. Which statement is true about the dose distribution when electron and photon beams are delivered from adjacent irradiation fields?
    1. The hot-spot occurs toward a photon field
    2. The hot-spot occurs toward an electron field
    3. No hot-spot and cold-spot are generated at the corner side of both fields.
    4. The hot-spot is produced at the corner side of an electron and a photon field
    5. The cold-spot is produced at the corner side of an electron and a photon field

54. Which statement is true about the advantages of treatment methods with non-planar beam orientation over coplanar beam orientation?
    1. reduces the irradiation field of the normal tissue
    2. requires less of CT image data for treatment plan
    3. provides wider choice to avoid irradiating critical organs
    4. reduces a treatment time
    5. no needs to concern about the collision

55. Which of the 4 R's of radiobiology is an indicator of radiation effects on tumors an d normal tissues that can reduce disruption of normal tissues?
    1. Repair, repopulation
    2. Repair, reoxygenation
    3. Repopulation, reassortment
    4. Repopulation, reoxygenation
    5. Reoxygenation, reassortment

56. What is a radiation-induced acute side effect?
    1. Carcinogenic
    2. Skin blisters
    3. Cataracts
    4. Radiation fatique
    5. Genetic effects

57. Which algorithm probabilistically calculates the interactions of photons to trace their paths in RTP system?
    1. Monte Carlo
    2. Pencil Beam
    3. IMRT Optimizer
    4. Clarkson Scatter
    5. Collapsed Cone Convolution

58. What is the dose rate threshold for high dose rate brachytherapy?
    1. 6 Gy/h or more
    2. 8 Gy/h or more
    3. 10 Gy/h or more
    4. 12 Gy/h or more
    5. 14 Gy/h or more

59. What is the best material for shielding neutrons from a linear accelerator using 15 MV?
    1. Lead
    2. Iron
    3. Aluminum
    4. Concrete
    5. Polyethylene

60. If a radioactive source falls to the operating room floor during interstitial treatment with I-125, what dosimeter is the best to find it?
    1. TLD
    2. Survey meter
    3. Pocket dosimeter
    4. Scintillation detector
    5. Thimble ionization chamber

61. When a small field (e.g., 4x4㎠) beam passes through an air cavity in the human b ody and re-enters the tissue, the dose is reduced, because?
    1. Scattering from the air cavity stops.
    2. The air cavity absorbs radiation.
    3. Backscatter appears in the air cavity.
    4. Rebuilds up at the air cavity and tissue boundary.
    5. Radiation is attenuated in the air cavity.

62. What is the primary use of the SRS cone in linear accelerator-based stereotactic rad iosurgery (SRS) techniques?
    1. For more accurate beam alignment.
    2. To reduce treatment time.
    3. To reduce geometrical penumbra.
    4. To improve dose conformity in the treatment area.
    5. To minimize patient movement.

63. Which of the following devices generates the SOBP (Spread Out Bragg Peak) in pr oton therapy?
    1. Degrader
    2. Scanning magnet

3. Range Compensator
4. Energy Selection System
5. Range Modulator Wheel or Ridge Filter

64. Which of the following is changing factors used for intensity modulation in VMAT (Volumetric Modulated Arc Treatment)?
    1. Gantry speed, dose rate, couch speed
    2. MLC speed, dose rate, energy
    3. Gantry speed, MLC speed, dose rate
    4. MLC speed, couch speed, energy
    5. Dose rate, gantry speed, couch speed

65. Which of the following statements about intensity-modulated radiation therapy (IMRT) is correct?
    1. Intensity modulation is performed by changing the speed of the MLC.
    2. The material of the MLC is brass to effectively reduce penumbra
    3. The wider the width of the MLC, the better the dose distribution.
    4. Window sliding method requires a lot of treatment time compared to step-and-shoot.
    5. The binary MLC used in tomotherapy is operated by a motorized method

66. Which of the following statements is true about stereotactic body radiation therapy (SBRT) dose planning?
    1. Compared to typical 3D CRTs, PTVs can deliver a more uniform dose.
    2. Delivers a very high total dose with fewer treatments compared to a typical 3D CRT.
    3. It is applied to the treatment that are much smaller than the irradiation surface used in general radiotherapy.
    4. It uses a specially made stereotactic frame to have similar precision as SRS.
    5. All of the above are correct.

67. Which of the following causes X-ray contamination in the dose distribution during electron beam therapy?
    1. Due to the low penetration of electron energy
    2. Due to electron scatter from side to side.
    3. Due to electron interactions produce neutrons
    4. No interact with the target

5. Due to scatter from the irradiation head, electron cone, and internal patient scatter.

68. Which of the following isotopes is most widely used in HDR afterloading brachytherapy?
    1. I-131
    2. I-125
    3. Cs-137
    4. Ir-192
    5. Pd-103

69. What is the tolerated dose (TD5/5) to the spinal cord for head and neck cancer treatment?
    1. 20~25Gy
    2. 30~35 Gy
    3. 45~50 Gy
    4. 55~60 Gy
    5. 60~65 Gy

70. Which of the following is the best treatment for a tumor located on the surface of the skin?
    1. X-ray therapy
    2. Electron therapy
    3. Proton therapy
    4. Tomotherapy
    5. Cyberknife

71. Which of the followings are true for the list of DICOM data transfer?
    1. Beam data, RT structure sets
    2. RT images, RT structure sets, RT dose
    3. Beam data, RT structure sets, RT images
    4. RT optimization parameters, RT structure sets
    5. RT optimization parameters, RT structure sets, RT dose

72. What factors changes the TMR?
    1. energy, SAD, depth
    2. SAD, depth, field size

3. energy, depth, field size
4. energy, dose rate, field size
5. SAD, energy, field size

73. Which test needs to be done to measure the movement and the position of a MLC?
    1. split-field test
    2. leaf-end effect
    3. picket fence technique
    4. tongue and groove test
    5. round edge position test

74. In general, what value is considered as an alpha/beta ratio of normal tissue?
    1. 2
    2. 3
    3. 5
    4. 10
    5. 15

75. Which of the following is true of IMRT optimization and segmentation?
    1. less dose reproducibility than a 3DCRT
    2. intensity of All beamlet is equal
    3. field size is determined by a number of segments
    4. field size is determined by a custom block
    5. optimization is processed using a collimator

76. Which of the following technique can make the least effect of an intra-fraction moti on?
    1. SRS
    2. SBRT
    3. IMRT
    4. VMAT
    5. RGRT

77. Which of the following is the most likely to produce a "horn" in a high-energy X-r ay isodose distribution curve?
    1. Central axis
    2. Under the wedge filter

3. Before the flattening filter
4. 10 cm deep in water phantom
5. Point Dmax of the wide filed area

78. Which of the following statements about intraoperative radiation therapy (IORT) is c orrect?
    1. Uses high-energy X-rays.
    2. Uses high energy electron or low tube voltage x-rays.
    3. Deep-seated radiation therapy.
    4. Low dose and multiple fractionation techniques.
    5. Treatment with beam spoilers.

79. Which of the following is the anatomical location of the ovoid used in cervical ca ncer brachytherapy (ICR)?
    1. Vagina
    2. Cervix
    3. Endometrium
    4. Fornix
    5. Ovary

80. Which of the following is NOT correct as a change factor in the isodose distributio n of a radiation treatment plan?
    1. Type of energy
    2. Exposure rate
    3. Beam quality
    4. Compensating filter
    5. SSD

81. Which of the following artifacts is caused by the hardware of the CT simulator?
    1. Streak artifact
    2. Motion artifact
    3. Metal artifact
    4. Photon starvation artifact
    5. Ring artifact

82. Which statement is true about the Mayneord F factor, which is applied to the variat ion of SSD values in two-dimensional radiation therapy planning?

1. The larger the survey area, the smaller the margin of error.
2. The margin of error increases for changes in small SSDs.
3. More effective for surfaces of small field with minimal scattering.
4. Significant errors can occur at high energies.
5. In general, the Mayneord F-factor underestimates the increase in the percentage of depth dose with increasing SSD.

83. Which of the following isodose curves represents the boundary(edge) of the treatmen t field?
    1. 100% isodose line
    2. 75% isodose line
    3. 50% isodose line
    4. 25% isodose line
    5. 10% isodose line or less

84. Which of the following is true about 4DCT images of lung cancer that show move ment throughout the tumor?
    1. Average image
    2. Contrast enhanced image
    3. Deformable registered image
    4. Maximum intensity projection
    5. Minimum intensity projection

85. Which of the following is true regarding of deciding the PTV margin created from CTV?
    1. IMRT applies the less margin on the PTV than 3D-CRT because it uses the opt imized dose distribution.
    2. PTV margin is the same for both IMRT and 3D-CRT because both techniques a re working under the same image-guided technique.
    3. The less PTV margin is needed for IMRT because IGRT technique can be used only for IMRT unlike 3D-CRT.
    4. PTV margin depends on the accuracy of the fused CT image.
    5. PTV margin applies the same regardless of the energy used (electron, photon, a nd proton)

86. What is the minimal thickness of lead to block a 15 MeV electron beam?
    1. 0.2 cm
    2. 0.5 cm
    3. 0.8 cm
    4. 1.1 cm
    5. 1.3 cm

87. A 10 X 10 cm^2 field and a 20 X 20 cm^2 are adjacent to each other at SSD 100 ㎝. What shall be the skin gap required to join the two fields at a depth of 5 cm ?
    1. 0.75 cm
    2. 0.89 cm
    3. 1.00 cm
    4. 1.21 cm
    5. 1.50 cm

88. What is the frequency of medical linear accelerator?
    1. 100 MHz
    2. 300 MHz
    3. 1000 MHz
    4. 3000 MHz
    5. 5000 MHz

89. Which of the following is modified value as a form of square section from a rectangular section of 10 × 15 ㎠ using A/P method?
    1. 8 × 8 ㎠
    2. 10 × 10 ㎠
    3. 12 × 12 ㎠
    4. 13 × 13 ㎠
    5. 15 × 15 ㎠

90. 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 (PDD_{10} or TMR_{10}^{20})
    5. optical distance indicator (ODI) check