

पुस्तिका में पृष्ठों की संख्या-32

No. of Pages in Booklet -32

पुस्तिका में प्रश्नों की संख्या-180

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Paper Code : 03

SUBJECT : Radiotherapy
(Broad Speciality)

BSAP-22

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प्रश्न पुस्तिका संख्या /
Question Booklet No.

समय: 3.00 घण्टे

अधिकतम अंक: 180

Time: 3.00 Hours

Maximum Marks: 180

प्रश्न-पत्र पुस्तिका के पेपर सील/ पॉलिथिन बैग को खोलने पर परीक्षार्थी यह सुनिश्चित कर लें कि प्रश्न पुस्तिका संख्या तथा ओ.एम.आर. उत्तर-पत्रक पर अंकित बारकोड समान हैं। इसमें कोई भिन्नता हो तो परीक्षार्थी वीक्षक से दूसरा प्रश्न-पत्र प्राप्त कर लें। ऐसा सुनिश्चित करने की जिम्मेदारी अभ्यर्थी की होगी।

On opening the paper seal/ polythene bag of the Question Booklet the candidate should ensure that Question Booklet Number and Barcode of OMR Answer Sheet must be same. If there is any difference, candidate must obtain another Question Booklet from Invigilator. Candidate himself shall be responsible for ensuring this.

परीक्षार्थियों के लिए निर्देश

1. सभी प्रश्नों के उत्तर दीजिए।
2. सभी प्रश्नों के अंक समान हैं।
3. प्रत्येक प्रश्न का केवल एक ही उत्तर दीजिए।
4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा।
5. प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं, जिन्हें क्रमशः 1, 2, 3, 4 अंकित किया गया है। अभ्यर्थी को सही उत्तर निर्दिष्ट करते हुए उनमें से केवल एक गोले अथवा बबल को उत्तर-पत्रक पर नीले बॉल प्वाइंट पेन से गहरा करना है।
6. OMR उत्तर-पत्रक इस परीक्षा पुस्तिका के अन्दर रखा है। जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर-पत्रक निकाल कर ध्यान से केवल नीले बॉल प्वाइंट पेन से विवरण भरें।
7. प्रत्येक गलत उत्तर के लिए प्रश्न अंक का 1/3 भाग काटा जायेगा। गलत उत्तर से तात्पर्य अशुद्ध उत्तर अथवा किसी भी प्रश्न के एक से अधिक उत्तर से है। किसी भी प्रश्न से संबंधित गोले या बबल को खाली छोड़ना गलत उत्तर नहीं माना जायेगा।
8. मोबाइल फोन अथवा इलेक्ट्रॉनिक यंत्र का परीक्षा हॉल में प्रयोग पूर्णतया वर्जित है। यदि किसी अभ्यर्थी के पास ऐसी कोई वर्जित सामग्री मिलती है, तो उसके विरुद्ध आयोग द्वारा नियमानुसार कार्यवाही की जायेगी।
9. कृपया अपना रोल नम्बर ओ.एम.आर. पत्रक पर सावधानी पूर्वक सही भरें। गलत अथवा अपूर्ण रोल नम्बर भरने पर 5 अंक कुल प्राप्तांकों में से काटे जा सकते हैं।
10. यदि किसी प्रश्न में किसी प्रकार की कोई मुद्रण या तथ्यात्मक प्रकार की त्रुटि हो, तो प्रश्न के हिन्दी तथा अंग्रेज़ी रूपान्तरों में से अंग्रेज़ी रूपान्तर मान्य होगा।

चेतावनी : अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, तो उस अभ्यर्थी के विरुद्ध पुलिस में प्राथमिकी दर्ज कराते हुए विविध नियमों-प्रावधानों के तहत कार्यवाही की जाएगी। साथ ही विभाग ऐसे अभ्यर्थी को भविष्य में होने वाली विभाग की समस्त परीक्षाओं से विवर्जित कर सकता है।

INSTRUCTIONS FOR CANDIDATES

1. Answer all questions.
2. All questions carry equal marks.
3. Only one answer is to be given for each question.
4. If more than one answers are marked, it would be treated as wrong answer.
5. Each question has four alternative responses marked serially as 1, 2, 3, 4. You have to darken only one circle or bubble indicating the correct answer on the Answer Sheet using BLUE BALL POINT PEN.
6. The OMR Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully with blue ball point pen only.
7. 1/3 part of the mark(s) of each question will be deducted for each wrong answer. A wrong answer means an incorrect answer or more than one answers for any question. Leaving all the relevant circles or bubbles of any question blank will not be considered as wrong answer.
8. Mobile Phone or any other electronic gadget in the examination hall is strictly prohibited. A candidate found with any of such objectionable material with him/her will be strictly dealt as per rules.
9. Please correctly fill your Roll Number in O.M.R. Sheet. 5 Marks can be deducted for filling wrong or incomplete Roll Number.
10. If there is any sort of ambiguity/mistake either of printing or factual nature, then out of Hindi and English Version of the question, the English Version will be treated as standard.

Warning : If a candidate is found copying or if any unauthorized material is found in his/her possession, F.I.R. would be lodged against him/her in the Police Station and he/she would liable to be prosecuted. Department may also debar him/her permanently from all future examinations.

इस परीक्षा पुस्तिका को तब तक न खोलें जब तक कहा न जाए।

Do not open this Test Booklet until you are asked to do so.

1. Example of radical scavengers present in the cells which can protect the target molecules by reacting with hydroxyl radicals -
 - (1) Thymine
 - (2) Histamine
 - (3) Glutathione
 - (4) Phosphates
2. The most validated pain intensity scale is known as the -
 - (1) Visual Analogue Scale (VAS)
 - (2) Faces Pain Scale Revised (FPS-R)
 - (3) Verbal Rating Scale (VRS-6)
 - (4) Numeric Rating Scale (NRS-11)
3. What is the recommended adjuvant therapy for a patient with a resected oral tongue cancer, pT2N1 cM0 with PNI, LVI, 5 mm margin and depth of invasion 7 mm?
 - (1) RT to the primary site and bilateral neck level I-IV
 - (2) RT to the primary site and bilateral neck level I -III
 - (3) RT to the primary site
 - (4) Chemo RT to the primary site and bilateral neck level I-IV
4. What is 5 year relapse rate of stage I seminoma after observation?
 - (1) 5%
 - (2) 15%
 - (3) 25%
 - (4) 35%
5. A 68-year-old male presents with favourable intermediate risk prostate cancer and elects to receive low dose rate brachytherapy alone. Which is an appropriate isotope and dose prescription?
 - (1) Iodine ¹²⁵ and 115 Gy
 - (2) Palladium ¹⁰³ and 100 Gy
 - (3) Palladium ¹⁰³ and 85 Gy
 - (4) Iodine ¹²⁵ and 145 Gy
6. Optimal cardiac doses as per QUANTEC -
 - (1) V₂₅ < 20 %
 - (2) V₂₅ < 30 %
 - (3) V₂₅ < 25 %
 - (4) V₂₅ < 10 %

7. Route of administration of Fentanyl is -
 - (1) Intramuscular
 - (2) Intravenous
 - (3) Transdermal
 - (4) Subcutaneous
8. IFRT dose for children post chemotherapy in Hodgkin's Lymphoma -
 - (1) 30 Gy/10%
 - (2) 40 Gy/20%
 - (3) 10 Gy/5%
 - (4) 20 Gy/10%
9. ITV is added to CTV for compensation of -
 - (1) set-up errors
 - (2) table movements
 - (3) physiological movements
 - (4) improper immobilization
10. Tests done for screening of colon cancer -
 - (1) Stool for Occult Blood
 - (2) Colonoscopy
 - (3) Barium Enema
 - (4) All of the above
11. Which shorter breast RT regimen is supported by a RCT showing equivalence or non-inferiority in local control to the comparative standard arm with at least 5 years of follow-up?
 - (1) 26 Gy in 5 fraction whole breast RT every day
 - (2) 38.5 Gy in 5 fraction whole breast RT once a week
 - (3) 35 Gy in 5 fraction partial breast RT every other day
 - (4) 38.5 Gy in 10 fraction partial breast RT twice a day
12. Which electron beam energy is MOST appropriate when treating a target at 4 cm depth that is prescribed to the 80% isodose line?
 - (1) 6 MeV
 - (2) 9 MeV
 - (3) 12 MeV
 - (4) 15 MeV

13. What percentage of children having CSF spread at the time of diagnosis of Medulloblastoma?
- (1) 10-20%
 - (2) 30-40%
 - (3) 50-60%
 - (4) 70-80%
14. ER testing is not indicated in which stage of endometrial carcinoma?
- (1) Stage II
 - (2) Stage III
 - (3) Stage IV
 - (4) Recurrent Endometrial Carcinoma
15. Which findings would be MOST consistent with a newly diagnosed thymoma?
- (1) Ptosis, miosis and anhidrosis
 - (2) Hyponatremia
 - (3) Hypercalcemia
 - (4) Muscle weakness with activity
16. What is the recommended conventionally fractionated prescription dose range for non-functioning pituitary adenomas?
- (1) 20-34 Gy
 - (2) 35-44 Gy
 - (3) 45-54 Gy
 - (4) 55-65 Gy
17. What is the appropriate surveillance plan for a patient with stage I seminoma undergoing observation after an orchiectomy?
- (1) Abdominal and Pelvic CT at 3, 6 and 12 Months
 - (2) Chest, Abdominal and Pelvic CT at 3, 6 and 12 months
 - (3) Abdominal and Pelvic CT at 4-6 and 12 months
 - (4) Chest, Abdominal and Pelvic CT at 4-6 and 12 months
18. Which concurrent chemotherapy regimen is most appropriate for preoperative chemo RT to 50.4 Gy in a HER2+T3N1 adenocarcinoma of the distal oesophagus?
- (1) Carboplatin, paclitaxel and trastuzumab
 - (2) Carboplatin and paclitaxel
 - (3) Carboplatin, paclitaxel and erlotinib
 - (4) Carboplatin, paclitaxel and capecitabine

19. Amount of Lung tissue that can be included in tangential field radiotherapy in breast cancer -
- (1) 1-2 cm
 - (2) 3-4 cm
 - (3) 2-3 cm
 - (4) <1cm
20. What is the most appropriate post-operative radiation dose for stage 1 neuroblastoma low risk?
- (1) 21 Gy
 - (2) 18 Gy
 - (3) 10.8 Gy
 - (4) No role of radiotherapy
21. What type of radiations is detected in a Positron Emission Tomography (PET) scan?
- (1) Beta radiation
 - (2) Two photons detected in coincidence
 - (3) Two positrons detected in coincidence
 - (4) A positron and an electron detected in coincidence
22. For a HDR vaginal cylinder treatment with a dose prescription point 5 mm from the cylinder surface, how does the choice of cylinder diameter influence the surface dose?
- (1) Diameter size does not affect the surface dose
 - (2) Smaller diameter cylinder will lead to a lower surface dose
 - (3) Larger diameter cylinder will lead to a lower surface dose
 - (4) Depends on the HDR radioisotope being used
23. Combining hyperthermia with radiation is considered a way of targeting cells in which phase of the cell cycle?
- (1) G1
 - (2) S
 - (3) G2
 - (4) G0
24. A patient with cancer in the left breast, histological type DCIS. Size measured after lumpectomy 3 cm. Lymph nodes histologically all negative for tumour. What is the correct pT and pN category?
- (1) pT2 N0
 - (2) pTis N0
 - (3) pT2 Nx
 - (4) pTx N0

25. Surgery is the treatment of choice for stage II NSCLC. As an adjuvant therapy, which of the following is recommended in a completely resected stage II NSCLC?
- (1) Chemotherapy
 - (2) Radiotherapy
 - (3) Chemo-radiation
 - (4) None of the above
26. Agents used in intracavitary chemotherapy -
- (1) Mitomycin-C
 - (2) Vincristine
 - (3) Methotrexate
 - (4) 6-TG
27. Radiotherapy dose for treatment of Glomus tumour is -
- (1) 30 – 40 Gy
 - (2) 45 – 55 Gy
 - (3) < 30 Gy
 - (4) 65 – 70 Gy
28. Extent of lymph node dissection in carcinoma endometrium -
- (1) Pelvic node dissection
 - (2) Pelvic + Para aortic node dissection
 - (3) Sentinel lymph node mapping
 - (4) Random sampling
29. For a patient with a bladder cancer invading into the muscularis propria, with one involved lymph node below the common iliac, what is the stage according to the AJCC 8th edition?
- (1) IIIA
 - (2) IIIB
 - (3) IVA
 - (4) IVB
30. Bladder dose constraint in IMRT for cancer prostate -
- (1) $V_{50} < 40$ Gy
 - (2) $V_{50} < 30$ Gy
 - (3) $V_{50} < 65$ Gy
 - (4) $V_{50} < 20$ Gy

31. The deposition of energy in matter from proton beams differs from photon beams in several ways. The majority of energy deposition from proton beams occurs -
- (1) Near the beginning of the track, forming the Bragg peak
 - (2) Near the middle of the track, forming the Bragg peak
 - (3) Near the end of the track, forming the Bragg peak
 - (4) Throughout the entire track, forming the Bragg peak
32. What is the typical initial treatment of a 4 year old child with a posterior fossa ependymoma?
- (1) Chemotherapy
 - (2) Maximal safe resection
 - (3) Craniospinal irradiation
 - (4) Focal RT to the tumor
33. Hormonal drug approved for prevention of carcinoma breast -
- (1) Anastrozole
 - (2) Letrozole
 - (3) Tamoxifen
 - (4) None of the above
34. What histopathology subtype is least associated with smoking in NSCLC?
- (1) Squamous cell carcinoma
 - (2) Adenocarcinoma
 - (3) Small cell carcinoma
 - (4) Large cell carcinoma
35. The reference depth for wedge angle is -
- (1) 10 cm
 - (2) Surface
 - (3) 5 cm
 - (4) 0.5 cm
36. A 55-year-old man with Oropharyngeal cancer stage T3N2 stage IVa was treated with cisplatin and radiation for 7 weeks. He completed his therapy 12 months ago. He improved initially, but now complains on severe fatigue, forgetfulness, dry skin, no sexual drive. He has dry mouth, but he can eat solid food. Which of the following is the most appropriate next step?
- (1) Order PET/CT scan to rule out brain metastatic disease
 - (2) Start patient on amphetamines
 - (3) Check TSH and free T4
 - (4) Send patient to psychiatrist to evaluate for possible depression

37. A 60-year-old post-menopausal woman in good health has completed adjuvant chemotherapy for a stage II breast cancer. The cancer was ER+, PR+ and HER2/neu negative. She had a mastectomy as initial therapy. Which of the following is the most appropriate next step?
- (1) An aromatase inhibitor for 2 years followed by Tamoxifen for 5 years
 - (2) Tamoxifen for 5 years followed by an aromatase inhibitor for 5 years
 - (3) Tamoxifen for 2 years followed by an aromatase inhibitor for 3 years
 - (4) An aromatase inhibitor for 5 to 10 years
38. A 60-year-old woman presents with a 2.2 cm right lung upper lobe adenocarcinoma and a 1.9 cm right lung lower lobe adenocarcinoma. What is this patient's AJCC 8th edition T classification?
- (1) T2b
 - (2) T3
 - (3) T4
 - (4) M1a
39. Which is the latest version of the International Statistical Classification of Diseases and Related Health Problems (ICD)?
- (1) ICD 10
 - (2) ICD 11
 - (3) ICD 12
 - (4) ICD 12X
40. What drug is used as first line therapy for patients with metastatic ALK rearrangement positive NSCLC?
- (1) Afatinib
 - (2) Osimertinib
 - (3) Alectinib
 - (4) Gefitinib
41. Routine radiotherapy field to treat spinal cord ependymoma include -
- (1) field restricted to involved vertebral region only
 - (2) one vertebra above and below the lesion
 - (3) 10 cm margin above and below the lesion
 - (4) two vertebrae above and below the lesion
42. LET for Cobalt-60 is -
- (1) 0.5 KeV/micron
 - (2) 2 KeV/micron
 - (3) 4.7 KeV/micron
 - (4) 0.2 KeV/micron

43. Radiation related skin complications are significantly increased with associated disease like -
- (1) Hyper-erythromatosis
 - (2) Sjogren Syndrome
 - (3) Scleroderma
 - (4) Raynaud's Phenomenon
44. Adjuvant post-operative chemo radiation in oral cavity cancers is indicated in case of -
- (1) multiple positive nodes
 - (2) extra capsular extension
 - (3) positive margins
 - (4) 2 + 3
45. As per MACH-NC analysis for concurrent chemo-radiation in head and neck cancers, the absolute survival benefit at 5 years is -
- (1) 8%
 - (2) 5%
 - (3) 10%
 - (4) 2%
46. In radiosurgery treatment of Craniopharyngioma doses to optic chiasm and optic nerve should be kept below -
- (1) 12 Gy
 - (2) 10 Gy
 - (3) 8 Gy
 - (4) 18 Gy
47. The use of which medication may complicate the diagnosis of a suspected primary CNS lymphoma?
- (1) Mannitol
 - (2) Sodium
 - (3) Albumin
 - (4) Corticosteroids
48. Which is an advantage of carbon ions versus protons?
- (1) Increased normal tissue sparing
 - (2) Higher LET
 - (3) Spread out Bragg peak
 - (4) Higher OER

49. Important structure to be spared for prevention of post radiotherapy dysphagia, in head and neck cancer radiotherapy is -
- (1) Parotid
 - (2) Submandibular salivary gland
 - (3) Pharyngeal constrictors
 - (4) Laryngeal mucosa
50. Which histological variant of meningioma is classified as grade-2?
- (1) Anaplastic
 - (2) Papillary
 - (3) Chordoid
 - (4) Rhabdoid
51. Which nodal levels are included in the CTV when treating a cT2N0 nasopharyngeal carcinoma confined to the Nasopharynx?
- (1) Bilateral retropharyngeal lymph nodes and cervical lymph node levels II, III and Va
 - (2) Bilateral retropharyngeal lymph nodes and cervical lymph node levels IB, II, III
 - (3) Bilateral cervical lymph node levels IB, II, III, IV and Va
 - (4) Bilateral cervical lymph node levels IB, II and III
52. LDR to HDR reduction factor for brachytherapy in cancer Cervix for <5 fractions of HDR treatment -
- (1) 0.33 to 0.36
 - (2) 0.4 to 0.45
 - (3) 0.54 to 0.6
 - (4) None of the above
53. Denosumab is beneficial over Zoledronic acid in terms of -
- (1) Effect on renal functions
 - (2) Overall survival
 - (3) Mandibular necrosis
 - (4) None of the above
54. A study evaluates the efficacy of a chemotherapy agent used to treat lung cancer and identifies the most common side effects prior to a large scale study. This is an example of what kind of clinical trial?
- (1) Pilot study
 - (2) Phase I
 - (3) Phase II
 - (4) Phase III

55. What is the region between the skin and the depth at the dose maximum called?
- (1) Isocenter
 - (2) Build – up region
 - (3) D max
 - (4) Entrance region
56. What is the cut off size in axial dimensions to define bulky disease as used in recent DLBCL clinical trials (e.g. RICOVER-60, UNFOLDER)?
- (1) ≥ 5 cm
 - (2) ≥ 7.5 cm
 - (3) ≥ 10 cm
 - (4) ≥ 12 cm
57. Cellular target for Crizotinib is -
- (1) BRAF
 - (2) EGFR
 - (3) HER2
 - (4) ALK
58. Which method results in the sharpest penumbra for a half beam blocked field?
- (1) MLC
 - (2) Primary collimator
 - (3) Secondary collimator
 - (4) Cerrobend lead alloy blocks
59. What is the 20 year cumulative risk of 2nd malignancy in patients treated for Ewing's sarcoma?
- (1) 6.2%
 - (2) 7.2%
 - (3) 8.2%
 - (4) 9.2%
60. Randomizations is done for avoiding -
- (1) Unmatched controls
 - (2) Unexpected side effects
 - (3) Systemic biases
 - (4) None of the above

61. HPV positive head and neck cancers respond favourably to -
- (1) Radiotherapy
 - (2) Chemotherapy
 - (3) 1 + 2
 - (4) Poor responders
62. In Gamma knife source housing of Co^{60} sources is distributed in a -
- (1) Hemispherical arrangement
 - (2) Circular arrangement
 - (3) Cylindrical arrangement
 - (4) Semi-circle arrangement
63. Early salvage adjuvant radiotherapy is indicated in prostate cancer in event of post-surgical biochemical failure, if -
- (1) Sporadic rise in PSA
 - (2) Persistent Dysuria
 - (3) Two consecutive rise in PSA with final PSA < 0.1 ng/mL
 - (4) Three consecutive rise in PSA
64. Rate of energy loss caused by ionization interaction for heavy charged particle is -
- (1) Inversely proportional to the square of the particle charge and proportional to the square of its velocity.
 - (2) Inversely proportional to the particle charge and proportional to the square of its velocity.
 - (3) Proportional to the particle charge and inversely proportional to the square of its velocity.
 - (4) Proportional to the square of the particle charge and inversely proportional to the square of its velocity.
65. Absolute survival benefit of adding chemotherapy to radiation in stage IB and IIB cancer Cervix -
- (1) 20%
 - (2) 12%
 - (3) 25%
 - (4) No benefit
66. In the study arm in START Trial B (UK) whole breast irradiation dose was -
- (1) 45 Gy/18%
 - (2) 40 Gy/15%
 - (3) 45 Gy/25%
 - (4) 40 Gy/20%

67. For which age group does the use of screening mammography avoid the most breast cancer deaths?
- (1) 39-49
 - (2) 50-59
 - (3) 60-69
 - (4) 70-74
68. Why is the radiation dose enhanced proximal to a metal prosthesis?
- (1) Backscatter from the metal
 - (2) Attenuation from the metal
 - (3) Pair production within the metal
 - (4) Temperature elevation within the metal
69. Which route of administration is subject to hepatic first pass?
- (1) Sublingual
 - (2) Oral
 - (3) Transdermal
 - (4) Inhalation
70. A 73-year-old male is diagnosed with prostate cancer and his staging workup reveals 6 bone metastases on his bone scan. Which of the following is considered a category 1 treatment recommendation per the NCCN?
- (1) Abiraterone and prednisone with ADT
 - (2) RT to the prostate with ADT
 - (3) RT to the prostate and SBRT to the bone metastases with ADT
 - (4) Pembrolizumab with ADT
71. Which cell cycle phases has the greatest impact on the length of the cell cycle?
- (1) G1
 - (2) G2
 - (3) S
 - (4) M
72. A 45-years-old woman undergoes wide local excision for a 3 cm, grade 3 and invasive lobular carcinoma. On final pathology, the sentinel node is negative and a single margin is close at < 1 mm. Which is the most appropriate next step in local management?
- (1) Re-excision of the close margin prior to RT
 - (2) Accelerated partial breast RT
 - (3) Whole breast RT using conventional fractionation
 - (4) Hypofractionated whole breast RT with a boost

73. What is the most common site of insufficiency fracture after EBRT?
- (1) Lumbar vertebrae
 - (2) Sacrum
 - (3) Pubis
 - (4) Acetabulum
74. As compared to a flattened 6 MV photon beam, how does the x-ray energy spectrum of a 6 MV Flattening Filter Free (FFF) beam differ?
- (1) Lower maximum photon energy
 - (2) Higher maximum photon energy
 - (3) Larger percentages of lower energy photons
 - (4) Larger percentage of higher energy photons
75. Which imaging study is a necessary component of the workup for a pediatric patient with high risk neuroblastoma?
- (1) Bone scan
 - (2) SPECT MRI
 - (3) Gallium scan
 - (4) MIBG scan
76. For Esophageal cancer, which lymph node station is considered non-regional or distant?
- (1) Lower paratracheal nodes
 - (2) Celiac nodes
 - (3) Pulmonary hilar nodes
 - (4) Lower cervical/supraclavicular nodes
77. In Glioblastoma Multiforme MGMT assay can predict -
- (1) Overall survival
 - (2) Chemosensitivity
 - (3) Radio sensitivity
 - (4) None of the above
78. Which of the following is not used in calculating a patient's Child-Pugh score?
- (1) Ascites
 - (2) Serum Bilirubin
 - (3) Serum Creatinine
 - (4) Albumin

79. What postoperative RT dose is recommended for a high grade malignant peripheral nerve sheath tumor of the upper extremity following R1 resection?
- (1) 50 Gy
 - (2) 60 Gy
 - (3) 66 Gy
 - (4) 72 Gy
80. 'Gold standard' treatment of metastatic spinal cord compression can include -
- (1) High dose dexamethasone/analgesics
 - (2) Neurosurgical intervention
 - (3) Radiotherapy
 - (4) All of the above
81. Regarding very High LET radiations -
- (1) Effects are enhanced by radiosensitizer.
 - (2) It directly improves oxygen flow to the tumor.
 - (3) Damage results mainly from oxygen free radicals.
 - (4) It induces direct DNA damage independent of oxygen radicals.
82. Which of the following best reflects the evidence on the value of giving palliative chemotherapy to patients with stage IV non – small cell lung cancer (the most advanced stage)?
- (1) Palliative chemotherapy improves survival at one year and is associated with improved quality of life.
 - (2) Palliative chemotherapy improves survival at one year, but side effects of chemotherapy are associated with impaired quality of life.
 - (3) Palliative chemotherapy is associated with improved quality of life, but there is no evidence that it prolongs survival.
 - (4) None of the above
83. Side effects of Opioid therapy -
- (1) Sedation
 - (2) Constipation
 - (3) Respiratory depression
 - (4) All of the above

84. A 62-years female underwent TAH and on biopsy endometrial carcinoma, grade 3 was found invading less than one third of the myometrium, LVI was absent, no information was available on lymph node status in the HPE report. Patient doesn't want to go for revised surgery. What will be the next line of treatment for this patient?
- (1) Observe
 - (2) Vaginal brachytherapy
 - (3) Adjuvant EBRT + vaginally brachytherapy
 - (4) Concurrent CT + RT
85. Which one of the following is not an accelerated partial breast irradiation technique?
- (1) Intra operative x-rays
 - (2) Permanent IR-192 implant
 - (3) 3D-CRT
 - (4) Balloon brachytherapy
86. What is the rate of supraclavicular recurrence in women with N1 breast cancer treated without nodal RT?
- (1) < 3%
 - (2) 4 – 6%
 - (3) 7 – 8%
 - (4) 9 – 10%
87. A 16-year-old patient has localized Ewing sarcoma of the sacrum and is receiving standard chemotherapy and definitive RT for local control. What dose should be given to the gross disease?
- (1) 40 Gy
 - (2) 50.4 Gy
 - (3) 55.8 Gy
 - (4) 72 Gy
88. Which of the following criteria doesn't fulfil patient as suitable for APBI as per ASTRO recommendations for APBI?
- (1) Size of tumour ≤ 2 cm
 - (2) Margin negative at least by 2 mm
 - (3) Age ≥ 50 years
 - (4) Neoadjuvant chemotherapy administered

89. Which of the following pairs of chemotherapeutic agents and their mechanism of action is FALSE?
- (1) Chlorambucil – DNA alkylator
 - (2) Methotrexate - thymidylate synthase inhibitor
 - (3) Etoposide – topoisomerase II poison
 - (4) Doxorubicin – DNA intercalator
90. Wedge angle required for beam placed at 90 degree is -
- (1) 30 Degree
 - (2) 45 Degree
 - (3) 60 Degree
 - (4) 15 Degree
91. Supraclavicular nodes irradiation is given in respect to axillary nodes status -
- (1) Axilla is negative
 - (2) 4+ nodes positive
 - (3) 1-3 nodes positive with low risk features
 - (4) None of the above
92. First echelon of lymph drainage of the tip of tongue is -
- (1) Submandibular nodes
 - (2) Deep cervical nodes
 - (3) Submental nodes
 - (4) Supraclavicular nodes
93. Giving instructions for breast self-examination is particularly important for female with which of the following medical problems?
- (1) Ovarian cancer
 - (2) Endometrial polyps
 - (3) Cervical dysplasia
 - (4) A dermoid cyst
94. Which research study design is used to determine the effectiveness of an intervention?
- (1) Phase I clinical trial
 - (2) Cohort study
 - (3) Phase III clinical trial
 - (4) Phase IV clinical trial

95. Which is a manifestation of chronic kidney injury as a result of RT?
- (1) Anemia
 - (2) Polycythemia
 - (3) Leukopenia
 - (4) Leucocytosis
96. What would be the appropriate adjuvant therapy for a patient with a 5×8 cm type-A thymoma resected with negative margins without capsular invasion?
- (1) Observation
 - (2) Adjuvant radiation
 - (3) Adjuvant chemotherapy
 - (4) Adjuvant radiation and chemotherapy
97. Human papilloma virus type 16 and 18 are detected in what percentage of penile cancer?
- (1) 30-35%
 - (2) 40-45%
 - (3) 50-55%
 - (4) 60-65%
98. Whole brain radiotherapy doses for treatment of primary CNS lymphoma are -
- (1) 25 – 30 Gy
 - (2) 45 – 50 Gy
 - (3) 30 – 40 Gy
 - (4) >50 Gy
99. Half-life of Caesium – 137 is -
- (1) 5.2 years
 - (2) 84 Days
 - (3) 28 years
 - (4) 30 years
100. Which type of radiation-induced DNA damage is most important for cell killing caused by exposure to ionizing radiation?
- (1) Base damage
 - (2) DNA double-strand break
 - (3) DNA single-strand break
 - (4) DNA – DNA inter-strand crosslink

101. N1 Nodal criteria for cancer Nasopharynx as per TNM staging is -
- (1) Unilateral lymph node upto 3 cm size
 - (2) Unilateral lymph node upto 6 cm size
 - (3) Bilateral lymph node upto 6 cms
 - (4) Supraclavicular nodes
102. Which is a clinically significant and potential advantage of proton therapy over photon therapy for patients with Hodgkin lymphoma?
- (1) Lower risk of secondary malignancy
 - (2) Ability to safely treat a smaller clinical target volume
 - (3) Improved progression free survival
 - (4) Faster daily treatment time
103. Which one of the following particles has the smallest mass?
- (1) Neutron
 - (2) Positron
 - (3) Proton
 - (4) Carbon ion
104. What is the risk of progression of solitary bone plasmacytoma to multiple myeloma in 10 years?
- (1) <10%
 - (2) 10-30%
 - (3) 31-50%
 - (4) 60-90%
105. How does geometric penumbra vary with Source to Surface Distance (SSD)?
- (1) Geometric penumbra increases as SSD increases
 - (2) Geometric penumbra does not change with SSD
 - (3) Geometric penumbra decreases as SSD increases
 - (4) Geometric penumbra is not clinically relevant
106. Based on the best available evidence, which of the following oral supplements has been proven to prevent lung cancer when taken by healthy people?
- (1) Alpha-tocopherol
 - (2) Beta carotene
 - (3) Retinol
 - (4) None of the above
107. A dosimeter used to calibrate brachytherapy source is -
- (1) Thimble ionization chamber
 - (2) Extrapolation chamber
 - (3) Parallel-plate chamber
 - (4) Well-type ion chamber

108. In the testis, what dose range in 2 Gy fractions produces permanent sterility?
- (1) 1-2 Gy
 - (2) 2-4 Gy
 - (3) 4-6 Gy
 - (4) 6-8 Gy
109. The Lynch syndrome is also known as hereditary non-polyposis colorectal cancer. Which of the following is feature of this syndrome?
- (1) Left sided colon cancers
 - (2) Autosomal dominant inheritance
 - (3) Multiple polyps beginning in adolescence
 - (4) Multiple cutaneous nevi
110. Permanent sterility in male requires single dose of to testes.
- (1) 6 Gy
 - (2) 12 Gy
 - (3) 15 Gy
 - (4) 3 Gy
111. Value calculated in most of studies by Kaplan – Meier plots is to determine-
- (1) Median DFS
 - (2) Median OS
 - (3) 1 + 2
 - (4) None of the above
112. In the WHO classification of brain tumors, which molecular feature is required for the diagnosis of an oligodendroglioma?
- (1) IDH wild type
 - (2) Combined 1p/19q loss
 - (3) TERT promoter mutation
 - (4) EGFR amplification
113. Mean recommended doses for parotid in IMRT plan -
- (1) 36 Gy
 - (2) 30 Gy
 - (3) 40 Gy
 - (4) 26 Gy
114. Rad-223, Sam-153 and Str-89 are radiopharmaceuticals in clinical use for bone metastatic disease. What physical property makes Rad-223 more tolerable than the other two agents?
- (1) Alpha particle emitter
 - (2) Beta particle emitter
 - (3) Gamma particle emitter
 - (4) Alpha, gamma and beta particle emitter

115. Genetic mutation in BRCA-1 and BRCA-2 have lifetime risk of development of breast cancer upto -
- (1) 20%
 - (2) 30%
 - (3) 85%
 - (4) 50%
116. Why are multiple beam angles and couch positions used for LINAC – based SRS treatments?
- (1) To increase the maximum dose within the target
 - (2) to decrease the maximum dose within the target
 - (3) To increase the volume of medium and high doses outside of the target
 - (4) To decrease the volume of medium and high doses outside of the target
117. According to the GEC ESTRO working group recommendations from 2006 for cervical cancer brachytherapy, what parameter MUST be reported for the high risk CTV?
- (1) V90
 - (2) D90
 - (3) V95
 - (4) D95
118. Which characteristic is most typical of an inflammatory breast cancer?
- (1) A discrete breast mass
 - (2) Slow disease progression
 - (3) Erythema over an otherwise normal breast
 - (4) Warmth and edema
119. Which patient with a low – grade glioma would gain an OS benefit from treatment with RT followed by chemotherapy based on RTOG 9802?
- (1) 18-year-old female with gross total resection
 - (2) 30-year-old female with gross total resection
 - (3) 55-year-old male with subtotal resection
 - (4) 30-year-old male with gross total resection
120. Which one is not true for Co⁶⁰ teletherapy machine?
- (1) Relative constancy of beam output
 - (2) Good field flatness for large fields
 - (3) Predictability of decay
 - (4) Lack of day-to-day small output fluctuations

121. What is linear attenuation coefficient (μ)?
- (1) The energy lost per unit length during x-ray interaction with matter.
 - (2) The interaction probability per unit length during x-ray interaction with matter.
 - (3) The energy lost per unit length during the ion particle interaction with matter.
 - (4) The interaction chance per unit length during the ion particle interaction with matter.
122. What is true in case of treatment of advanced melanoma?
- (1) Radical Radiotherapy is standard of care
 - (2) Surgery alone is sufficient
 - (3) Chemotherapy alone is standard of care
 - (4) Adjuvant interferon based therapy is standard of care
123. Gold standard drug for metastatic pancreatic adenocarcinoma is -
- (1) Carboplatin
 - (2) FFU
 - (3) Capecitabine
 - (4) Gemcitabine
124. According to the Veterans Administration Lung Study Group (VALSG), Limited Stage (LS) small cell lung cancer is defined as -
- (1) disease confined to one hemithorax that can be encompassed in a tolerable radiation field
 - (2) disease that can be treated with four cycles of radiation concurrent with chemo and not involving opposite side mediastinal nodes
 - (3) disease involving less than 90% of one lung and at most contralateral scalene lymph nodes
 - (4) None of the above
125. Which one is not true for Au-198?
- (1) Half - life of 5.6 days
 - (2) Monoenergetic gamma rays of 0.412 MeV are emitted
 - (3) Are used for permanent implants
 - (4) Beta rays of maximum energy 0.96 MeV are emitted
126. Which is the most common presentation of Hodgkin's lymphoma?
- (1) Painless cervical or supraclavicular lymphadenopathy
 - (2) Tracheal compression
 - (3) Inguinal lymphadenopathy
 - (4) B symptoms
127. Lethal chromosome aberrations are -
- (1) Dicentric
 - (2) Ring aberrations
 - (3) Anaphase bridge
 - (4) All of the above

128. A female with a cT3N1M0 ER/PR-negative HER2 +ve breast cancer receives neoadjuvant TCHP followed by a mastectomy with sentinel lymph node biopsy and achieves a pCR. What adjuvant therapy is recommended?
- (1) Continue a full year of Trastuzumab +/- Pertuzumab with no RT
 - (2) RT to the chest wall and regional lymph nodes with concurrent Trastuzumab +/- Pertuzumab
 - (3) RT to the chest wall and regional lymph nodes with concurrent TDM-1
 - (4) RT to the chest wall only with concurrent TDM-1
129. CD-99, a marker used in IHC for round cell tumour, is found negative in -
- (1) Ewing's sarcoma
 - (2) Lymphoblastic lymphoma
 - (3) Synovial sarcoma
 - (4) Neuroblastoma
130. For resected oral cavity cancer with extranodal extension, the key benefit of adding concurrent cisplatin to postoperative RT is reduce -
- (1) local – regional recurrence
 - (2) metastatic disease
 - (3) second primary cancers
 - (4) radiation dose
131. As per current standard of care, CSI dose in Medulloblastoma is -
- (1) 30 Gy
 - (2) 36 Gy
 - (3) <24 Gy
 - (4) None of the above
132. Why brachytherapy is generally avoided for gingival lesions?
- (1) Difficult to put the applicators
 - (2) Dose distribution inhomogeneous
 - (3) High risk of osteoradionecrosis
 - (4) Resistant lesions to radiotherapy
133. What is the percentage of worldwide cancers estimated to be caused by infections?
- (1) 1%
 - (2) 5%
 - (3) 20%
 - (4) 50%

134. Cobalt 60 produced as a result of -
- (1) Neutron irradiation
 - (2) Proton irradiation
 - (3) Nuclear fission
 - (4) Nuclear fusion
135. Partial response as per RECIST 1 criteria is -
- (1) >30% Regression
 - (2) >20% Regression
 - (3) 10 – 15 % Regression
 - (4) None of the above
136. The addition of memantine to WBRT, yielded what outcome compared to WBRT?
- (1) Better intracranial control
 - (2) Poorer intracranial control
 - (3) Better cognitive function
 - (4) Poorer cognitive function
137. Which is the BEST treatment for a 55-year-old female who underwent breast conserving surgery for a pT1cN1mi cM0 ER + HER2- breast cancer and 21 gene recurrence score of 22?
- (1) RT followed by endocrine therapy
 - (2) Chemotherapy followed by RT
 - (3) Chemotherapy followed by RT and endocrine therapy
 - (4) Endocrine therapy alone
138. Which of the following ionization processes represents the principal interaction with tissue for x-rays used in radiotherapy?
- (1) Pair production
 - (2) Photoelectric effect
 - (3) Compton process
 - (4) Coherent scattering
139. Choice of treatment for Follicular Lymphoma Stage I and II -
- (1) Radiotherapy alone
 - (2) Chemotherapy followed by IFRT
 - (3) Chemotherapy alone
 - (4) Immunotherapy
140. As per RAPIDO trail, short course radiotherapy in rectal cancer is -
- (1) 38 Gy in 10 fractions
 - (2) 30 Gy in 10 fractions
 - (3) 25 Gy in 5 fractions
 - (4) 30 Gy in 5 fractions

141. The lateral border of cervical lymph node level is defined by what structure?
- (1) Mandible
 - (2) Digastric muscle
 - (3) Submandibular gland
 - (4) Sternocleidomastoid muscle
142. A celiac plexus block provides effective relief of pain associated with primary cancers at each of the following locations, except -
- (1) adrenal gland
 - (2) liver
 - (3) pancreas
 - (4) sigmoid colon
143. Which of the following is not correct for dose prescription points in intracavitary brachytherapy?
- (1) Point A is defined as the point 2 cm superior to a horizontal line passing from the top of the lateral fornices in the midline and 2 cm lateral to it.
 - (2) Point A is the point where radiation necrosis is first seen.
 - (3) The uterine artery crosses the ureter at point A.
 - (4) Point A is the minimum dose for healthy tissues and the maximum dose for tumor.
144. Which treatment offers the highest chance of larynx preservation for locally advanced (T3/T4) larynx cancer?
- (1) RT alone
 - (2) Induction chemotherapy followed by RT
 - (3) RT followed by chemotherapy
 - (4) Concurrent chemo-RT
145. α/β ratio for late responding tissues is -
- (1) 10
 - (2) 5
 - (3) 3
 - (4) 1
146. Most common subtype of Hodgkin's lymphoma seen in children in India is -
- (1) Nodular Sclerosis
 - (2) Mixed Cellularity
 - (3) Nodular Lymphocytic Predominant Hodgkin's Lymphoma (NLPHL)
 - (4) Lymphocyte Rich Classical Hodgkin's Lymphoma (LRCHL)

147. What is the MOST conventional dose and fractionation for a 7-year-old patient undergoing whole lung irradiation for lung metastases in rhabdomyosarcoma?
- (1) 10.5 Gy in 7 fraction
 - (2) 10.8 Gy in 6 fraction
 - (3) 12 Gy in 8 fraction
 - (4) 15 Gy in 10 fraction
148. FDG-PET is useful in radiotherapy planning of lung cancer for -
- (1) Exclusion of consolidation area
 - (2) Motion management
 - (3) Exclusion of Tubercular foci
 - (4) Differentiation of metastasis from primary
149. Recommended dose to para aortic nodes in treatment of carcinoma Cervix -
- (1) 45 Gy
 - (2) 60 Gy
 - (3) 65 Gy
 - (4) 40 Gy
150. Multidrug resistance in tumor cells is often attributed to extrusion of drugs mediated by overexpression of which of the following proteins?
- (1) P-glycoprotein
 - (2) Bcl-2
 - (3) BAX
 - (4) TP53
151. Which RT treatment regimen is appropriate definitive of a 3 cm basal cell carcinoma skin?
- (1) 50 Gy in 15 fraction
 - (2) 55 Gy in 20 fraction
 - (3) 60 Gy in 30 fraction
 - (4) 70 Gy in 35 fraction
152. Metastatic spinal cord compression occurs most frequently in -
- (1) the cervical spine
 - (2) the thoracic spine
 - (3) the lumbar spine
 - (4) the cauda equine

153. Treatment of choice in localised primary orbital lymphoma is -
- (1) Radiotherapy alone
 - (2) Chemotherapy followed by radiation
 - (3) Chemotherapy followed by surgery
 - (4) Chemotherapy alone
154. What is the role of a magnetron or klystron in a linear accelerator during photon beam production?
- (1) Generates radiofrequency power for acceleration
 - (2) Transfers radiofrequency power to an electron beam
 - (3) Redirects an electron beam toward machine isocenter
 - (4) Creates photons from an accelerated electron beam
155. What is an indication for postoperative chemo RT following total gastrectomy for localized node negative gastric adenocarcinoma?
- (1) D1 lymph node dissection
 - (2) Negative surgical margins
 - (3) D2 lymph node dissection
 - (4) Diffuse-type adenocarcinoma
156. What is the Planning Target Volume (PTV)?
- (1) Volume accounting for uncertainties in treatment setup
 - (2) Volume accounting for changes in target shape over treatment course
 - (3) Volume defining the beam block margins to ensure target dose coverage
 - (4) Volume defining the GTV motion during physiological movements
157. Which systemic agent is used in the treatment of nasopharyngeal cancer but is not commonly used for other squamous cell carcinomas of the head and neck?
- (1) Carboplatin
 - (2) Hydroxyurea
 - (3) Gemcitabine
 - (4) Pembrolizumab
158. What is the primary mechanism through which taxanes sensitize cells to RT?
- (1) They promote reoxygenation of the tumor microenvironment
 - (2) They result in cell cycle arrest at the G2/M phase
 - (3) They promote apoptosis
 - (4) They inhibit angiogenesis

159. A 60-year-old patient presents with a stage I lymphoma involving Mucosa Associated Lymphoid Tissue (MALT) of the left parotid gland. What is a reasonable standard prescription dose for definitive RT?
- (1) 24 Gy
 - (2) 36 Gy
 - (3) 45 Gy
 - (4) 50.4 Gy
160. Chance of inguinal relapse in penis cancer with N₀ groin, if inguinal radiotherapy is not given -
- (1) 10%
 - (2) 20%
 - (3) 30%
 - (4) <5%
161. Gamma knife contains these number of Cobalt – 60 sources -
- (1) 251
 - (2) 151
 - (3) 201
 - (4) 225
162. What cellular process is considered a “hallmark of cancer”?
- (1) Promotion of growth suppressors
 - (2) Immunogenesis
 - (3) Disabling replicative immortality
 - (4) Inducing angiogenesis
163. Usual margin given for low grade glioma around traditional MRI based GTV is -
- (1) 2 cm
 - (2) 1.5 cm
 - (3) 1 cm
 - (4) 3 cm
164. What is the lowest risk-group of prostate cancer where a metastatic workup with a bone scan may be recommended?
- (1) Low risk
 - (2) Favourable intermediate
 - (3) Unfavourable intermediate
 - (4) High risk

165. What is the MOST likely diagnosis of a midline mass arising from the sacrum and coccyx that is brachyury positive on biopsy?
- (1) Chondrosarcoma
 - (2) Chordoma
 - (3) Ewing sarcoma
 - (4) Giant cell tumor of bone
166. Risk of developing dose limiting toxicity of pneumonitis with bleomycin is -
- (1) 10%
 - (2) 20%
 - (3) 30%
 - (4) 50%
167. In cerebrovascular syndrome as a result of acute total body irradiation the death occurs in -
- (1) 12-24 hrs.
 - (2) 24-48 hrs.
 - (3) 48-72 hrs.
 - (4) 72-96 hrs.
168. What is the optimal total radiation dose required for immunosuppression and tumoral cell eradication in fractionated TBI regimens?
- (1) 2-4 Gy
 - (2) 4-6 Gy
 - (3) 6-8 Gy
 - (4) 8-12 Gy
169. A patient with cT4cN1M0 triple negative breast cancer and has no response to 4-cycles of neoadjuvant multidrug chemotherapy. What is the next step in her management?
- (1) Mastectomy with axillary node dissection
 - (2) Comprehensive RT followed by mastectomy
 - (3) Change chemotherapy and if still no response, proceed with RT
 - (4) Counsel patient of very poor prognosis and advise supportive care
170. A 42-year-old female was incidentally found to have an infiltrative contrast enhancing asymptomatic 6 cm mass in the right rectus abdominis muscle. Biopsy reveals desmoid fibromatosis. What treatment should be initially recommended?
- (1) Active surveillance
 - (2) Definitive radiation
 - (3) Sorafenib
 - (4) Surgical resection

171. Which process is responsible for the generation of photons in the target of a linear accelerator?
- (1) Photoelectric effect
 - (2) Bremsstrahlung interaction
 - (3) Compton scattering
 - (4) Elastic scattering
172. In which histopathological category of salivary gland malignancy lymph node metastasis is lowest?
- (1) Adenoid cystic carcinoma
 - (2) Mucoepidermoid carcinoma
 - (3) Acinic cell carcinoma
 - (4) Undifferentiated carcinoma
173. Which of the following are paired cartilages in the larynx?
- (1) Thyroid
 - (2) Arytenoid
 - (3) Cricoid
 - (4) Epiglottis
174. PTV margin over CTV posteriorly in cancer prostate are -
- (1) 6 mm
 - (2) 10 mm
 - (3) 13 mm
 - (4) 15 mm
175. What depth, in water, is the beam flatness typically specified for a clinical photon beam?
- (1) d-max
 - (2) 5 cm
 - (3) 10 cm
 - (4) 15 cm
176. What is a benefit of IMRT over 3D-CRT after hysterectomy for gynaecologic cancers?
- (1) Increase OS
 - (2) Increase local control
 - (3) Less acute GI side effects
 - (4) Improved patient compliance
177. What is the most sensitive means of evaluating extent of residual disease in breast cancer patient, status-post neoadjuvant chemotherapy?
- (1) Physical exam
 - (2) Mammography
 - (3) Ultrasound
 - (4) MRI

178. It is suspected that a patient has inflammatory breast carcinoma. Where tumor cells must be identified to make that specific diagnosis?
- (1) Terminal duct lobules
 - (2) Dermal lymphatic
 - (3) Pectoralis muscle
 - (4) Nipple/areola complex
179. Relative cancer causation incidence from BRCA I and BRCA II mutations -
- (1) 2:1
 - (2) 1:1
 - (3) 3:1
 - (4) 3:2
180. Common strains of HPV for causation of cancer Cervix are -
- (1) 10 & 12
 - (2) 16 & 18
 - (3) 20 & 22
 - (4) None of the above

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