

## AYD

### PROVISIONAL ANSWER KEY (CBRT)

Name of the post	Assistant Professor, Radiotherapy, General State Service, Class-1
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THE LINK FOR ONLINE OBJECTION SYSTEM WILL START FROM 04-09-2021; 04:00 PM ONWARDS

### Instructions / સૂચન

Candidate must ensure compliance to the instructions mentioned below, else objections shall not be considered: -

- (1) All the suggestion should be submitted through **ONLINE OBJECTION SUBMISSION SYSTEM** only. Physical submission of suggestions will not be considered.
- (2) Question wise suggestion to be submitted in the prescribed format (proforma) published on the website / online objection submission system.
- (3) All suggestions are to be submitted with reference to the Master Question Paper with provisional answer key (Master Question Paper), published herewith on the website / online objection submission system. Objections should be sent referring to the Question, Question No. & options of the Master Question Paper.
- (4) Suggestions regarding question nos. and options other than provisional answer key (Master Question Paper) shall not be considered.
- (5) Objections and answers suggested by the candidate should be in compliance with the responses given by him in his answer sheet. Objections shall not be considered, in case, if responses given in the answer sheet /response sheet and submitted suggestions are differed.
- (6) Objection for each question should be made on separate sheet. Objection for more than one question in single sheet shall not be considered.

ઉમેદવારે નીચેની સૂચનાઓનું પાલન કરવાની તકેદારી રાખવી, અન્યથા વાંધા-સૂચન અંગે કરેલ રજૂઆતો ધ્યાને લેવાશે નહીં

- (1) ઉમેદવારે વાંધા-સૂચનો ફક્ત ઓનલાઇન ઓબ્જેક્શન સબમીશન સીસ્ટમ દ્વારા જ સબમીટ કરવાના રહેશે. રૂબરૂ અથવા ટપાલ દ્વારા આયોગની કચેરીએ મોકલવા આવેલ વાંધા-સૂચનો ધ્યાને લેવામા આવશે નહીં જેની ખાસ નોંધ લેવી.
- (2) ઉમેદવારે વાંધા-સૂચનો રજૂ કરવા વેબસાઇટ / ઓનલાઇન ઓબ્જેક્શન સબમીશન સીસ્ટમ પર પ્રસિધ્ધ થયેલ નિયત નમૂનાનો જ ઉપયોગ કરવો.
- (3) ઉમેદવારે પોતાને પરીક્ષામાં મળેલ પ્રશ્નપુસ્તિકામાં છપાયેલ પ્રશ્નક્રમાંક મુજબ વાંધા-સૂચનો રજૂ કરતા તમામ વાંધા-સૂચનો વેબસાઇટ પર પ્રસિધ્ધ થયેલ પ્રોવિઝનલ આન્સર કી (માસ્ટર પ્રશ્નપત્ર)ના પ્રશ્ન ક્રમાંક મુજબ અને તે સંદર્ભમાં રજૂ કરવા.
- (4) માસ્ટર પ્રશ્નપત્રમાં નિર્દિષ્ટ પ્રશ્ન અને વિકલ્પ સિવાયના વાંધા-સૂચનો ધ્યાને લેવામાં આવશે નહીં.
- (5) ઉમેદવારે પ્રશ્નના વિકલ્પ પર વાંધો રજૂ કરેલ છે અને વિકલ્પ રૂપે જે જવાબ સૂચવેલ છે એ જવાબ ઉમેદવારે પોતાની ઉત્તરવહીમાં આપેલ હોવો જોઈએ. ઉમેદવારે સૂચવેલ જવાબ અને ઉત્તરવહીનો જવાબ ભિન્ન હશે તો ઉમેદવારે રજૂ કરેલ વાંધા-સૂચનો ધ્યાનમા લેવાશે નહીં.
- (6) એક પ્રશ્ન માટે એક જ વાંધા-સૂચન પત્રક વાપરવું. એક જ વાંધા-સૂચનો પત્રકમાં એકથી વધારે પ્રશ્નોની રજૂઆત કરેલ હશે તો તે અંગેના વાંધા-સૂચનો ધ્યાને લેવાશે નહીં.

Website link for online objection submission system : [www.safevaults.in/login](http://www.safevaults.in/login)

001. 55 years old gentleman underwent a surgery for carcinoma lateral border tongue. Post-op histopathology is suggestive of a maximum tumor dimension of 4 cm along with 5 nodes positive along with extracapsular extension in one of them. What should be the adjuvant treatment option for this patient?
- (A) Post-op Radiotherapy along with Cetuximab  
 (B) Post-op Radiotherapy-60-66 Gy  
 (C) Post-op Radiotherapy-70 Gy  
 (D) Post-op Radiotherapy along with Cisplatin
002. Geometric Penumbra increases with increase in all except:
- (A) SOURCE-surface distance (B) Source diameter  
 (C) Source-diaphragm distance (D) Depth in the patient
003. For a conventional planning of T1N0M0 carcinoma of glottic larynx. Which of the following is false?
- (A) The typical field size is a square of 5-6 cm  
 (B) Upper border is kept at the top of the thyroid cartilage  
 (C) Inferior border is above the cricoid cartilage  
 (D) Posterior border is at the anterior edge of the vertebral body
004. MUPIT is used for recurrent carcinoma cervix. Which of the following is not correct?
- (A) It has two types of needle- straight and divergent  
 (B) The divergent needles are angulated at 19 degree  
 (C) It has two plates  
 (D) There are 34 holes in it
005. Which of the following is not a treatment option for Stage I testicular seminoma?
- (A) Active Surveillance (B) 1-2 cycle of Carboplatin (AUC 7)  
 (C) Para-aortic irradiation (D) Three cycles of BEP chemotherapy
006. Which one of the following is not an AIDS defining malignancy?
- (A) Kaposi Sarcoma (B) NHL  
 (C) Carcinoma of uterine cervix (D) Anal Carcinoma
007. World cancer day is celebrated on -
- (A) 4<sup>th</sup> Feb (B) 5<sup>th</sup> June  
 (C) 5<sup>th</sup> March (D) 14<sup>th</sup> November
008. Half-life of Temozolomide is
- (A) 2 hours (B) 2 days  
 (C) 2 mins (D) 20 hours
009. Which of the following is the 80% isodose line for electrons?
- (A) E/2 (B) E/3  
 (C) E/4 (D) E/5
010. What is the best treatment approach for Squamous cell carcinoma of upper 1/3<sup>rd</sup> of Esophagus ?
- (A) Definitive Chemo-radiotherapy  
 (B) Esophagectomy followed by radiation  
 (C) Esophagectomy followed by chemotherapy  
 (D) Neoadjuvant Chemoradiation followed by surgery

011. A 50 yrs old male was diagnosed with MGMT methylated Glioblastoma multiforme post incomplete resection. What should be the best treatment option
- (A) Radiotherapy alone (B) PCV chemotherapy  
 (C) Radiotherapy plus Temozolomide (D) Watchful waiting
012. Which one of them is not included in four 'R's of Radiobiology?
- (A) Re-assortment (B) Repair  
 (C) Re-population  (D) Regeneration
013. Which of them is not correct with the Linear accelerator?
- (A) When treating with electron beams, the target is moved out the beam's path.  
 (B) Flattening filters are used for electron beams  
 (C) Ionization chamber is responsible for shutting machine off when desired dose is delivered  
 (D) None of the above
014. Activity of 1 gram of Radium is:
- (A) 1 Curie (B) 8.25 Curie  
 (C)  $3.7 \times 10^{10}$  Bq (D)  $3.61 \times 10^{10}$  Bq
015. Based on experience in head and neck cancers, accelerated repopulation likely begins how many days after the initiation of fractionated radiation therapy?
- (A) 7 days (B) 14 days  
 (C) 21 days  (D) 28 days
016. ARTIST trial was conducted in carcinoma stomach. Which of the following is not true?
- (A) The updated results showed no survival advantage in the study population.  
 (B) The subgroup analysis revealed significant survival advantage for LN positive patients.  
 (C) The chemotherapy regimen included Inj. Oxaliplatin and Tab. Capecitabine.  
 (D) The ARTIST II trial is proposed for LN positive patients
017. The External beam radiotherapy dose recommended for Thyroid Ophthalmopathy is-
- (A) 10 Gy in 5 fractions  (B) 20 Gy in 10 fractions  
 (C) 30 Gy in 15 fractions (D) 45 Gy in 25 fractions
018. Which type of radiation-induced DNA damage is most important for cell killing caused by exposure to ionizing radiation?
- (A) Base damage  (B) DNA double-strand break  
 (C) DNA single-strand break (D) DNA-protein crosslink
019. Which of the following ionization processes represents the principal interaction with tissue for X-rays used in radiotherapy?
- (A) Pair production (B) Photoelectric effect  
 (C) Compton process (D) Photodisintegration
020. Which of the following agents acts in a cell cycle specific fashion?
- (A) Cisplatin (B) Ifosfamide  
 (C) 5-FU (D) BCNU

021. What is the most common type of cancer identified in children who were in the vicinity of the Chernobyl nuclear power plant when it exploded in 1986?
- (A) Osteosarcoma (B) Leukemia  
 (C) Thyroid cancer (D) Mesothelioma
022. What material is not used in making Cerrobend shielding blocks?
- (A) Bismuth (B)  Copper  
 (C) Lead (D) Tin
023. TLD badges in India uses which Thermo-luminescence Phosphor-
- (A) LiF: Mg, Ti (B) LiF: Mg, Cu,P  
 (C) CaF<sub>2</sub> : Mn (D)  CaSo<sub>4</sub>:Dy
024. The gastro-intestinal syndrome results from a total body exposure to about-
- (A) 4 Gy (B) 15 Gy  
 (C) 25 Gy (D)  10 Gy
025. Which of the following statements concerning hyperthermia is TRUE?
- (A) G2 cells are the most resistant with respect to both heat and X-rays  
 (B) Cells maintained in a low pH microenvironment tend to be more sensitive to heat than cells maintained at physiologic pH  
 (C) Acutely hypoxic tumor cells are more sensitive to hyperthermia than chronically hypoxic ones  
 (D) In laboratory rodents, hyperthermia tends to increase blood flow in tumors, but decrease blood flow in most normal tissues
026. As attending radiation oncologists, you have been called to review a 3D-CRT plan for carcinoma lung. V30 for heart as per QUANTEC is acceptable, if the mean dose is less than:
- (A) 26 Gy (B) 36 Gy  
 (C) 46 Gy (D) 56 Gy
027. Mini-mental field used in the treatment of Hodgkins Lymphoma includes all except:
- (A) Mediastinum (B) Axilla  
 (C) Cervical (D) Supraclavicular
028. Which of the following antitumor agents cause prolonged azoospermia in men, EXCEPT:
- (A) Radiation to testis (B)  Carboplatin  
 (C) Cyclophosphamide (D) Melphalan
029. According to AAPM Task Group TG-76, real time tumor tracking or respiratory gating is warranted, if the magnitude of target motion in any direction is in excess
- (A) 3 mm (B)  5 mm  
 (C) 7 mm (D) 10 mm
030. A 45 year male with a history of 30 pack years of cigarettes presented with a history of cough for 2 months. Chest X-ray revealed a speculated mass in the lower lobe of right lung. Biopsy from the mass revealed adenocarcinoma. Further markers suggested a diagnosis of primary from lung. All of the following markers are positive in a primary adenocarcinoma of lung EXCEPT?
- (A) CK7 (B) TTF-1  
 (C) CK20 (D) EGFR mutation

031. Latest USPSTF guidelines on lung cancer screening recommendations is released in March 2021. What is true regarding the same
- (A) Screening consists of low dose CT scan annually  
 (B) Screening is recommended in adults age 50-80 years with high risk (>20 packs/year)  
 (C) It is not recommended in persons with limited life expectancy  
 (D) All of the above
032. Which of the following descriptions best fits the definition of febrile neutropenia according to ESMO guidelines on febrile neutropenia?
- (A) Oral temperature > 38°C for 2 hours and absolute neutrophil count <  $1.0 \times 10^9/l$   
 (B) Oral temperature > 38.5°C and absolute neutrophil count <  $0.5 \times 10^9/l$   
 (C) Oral temperature with two consecutive readings > 37.5°C and absolute neutrophil count <  $0.5 \times 10^9/l$   
 (D) Oral temperature > 38.5°C and absolute neutrophil count <  $1.0 \times 10^9/l$
033. What is not among the standard treatment options for locally advanced rectal cancer?
- (A) Long course chemoradiotherapy followed by surgery at 6-8 weeks  
 (B) Short course radiotherapy followed by surgery at 6-8 weeks  
 (C) Short course radiotherapy followed by surgery after 1 week  
 (D) Long course radiotherapy followed by local excision if Complete pCR
034. What is not true about Continuous Hyperfractionated accelerated radiotherapy?
- (A) Acute reactions are peak after completion of treatment  
 (B) Radiotherapy is delivered three times a day  
 (C) Effective in non small cell lung cancers  
 (D) Radiotherapy is given six days a week
035. A method of allocating treatment such that each subject has an equal chance of receiving any of the possible treatments in a clinical trial is known as:
- (A) Blinding  (B) Randomization  
 (C) Allocation Concealment (D) None of the above
036. The half life of Iridium-192 is
- (A) 2.5 months (B) 74 months  
 (C) 2.7 days (D) None of the above
037. The three principle of ALARA include all except
- (A) Time (B) Distance  
 (C) Shielding  (D) Monitoring
038. Which radiation interaction depends only on number of electrons per gram?
- (A) Pair production (B) Photo-electric absorbtion  
 (C) Compton effect (D) Coherent scattering
039. In Lung cancer radiotherapy, motion management strategies are utilised. Which among is a free breathing motion management solution?
- (A) Automated breath coordinator (B) DIBH  
 (C) RPM (D) Abdominal compression

040. How the CT simulator used in radiotherapy is different than the CT used in radiotherapy?  
 (A) Laser mounted on the wall  
 (B) It has a flat couch  
 (C) The bore is wider than the one used in CT  
 (D) All of the above
041. What structures are preserved in Type I Modified radical neck dissection?  
 (A) Spinal accessory nerve (B) Internal Juglar vein  
 (C) Sternocleidomastoid (D) All of the above
042. Which of the following is the most commonly seen Soft tissue sarcoma in adults?  
 (A) Malignant fibrous histiocytoma (B) Leiomyosarcoma  
 (C) Liposarcoma (D) Rhabdomyosarcoma
043. Which syndrome is associated with Wilm's tumor?  
 (A) Denys-Drash syndrome (B) Sotos Syndrome  
 (C) Perlman syndrome (D) All of the above
044. What is not true regarding madam Curie?  
 (A) She discovered both radium and polonium  
 (B) She was the first woman to win a Nobel Prize  
 (C) She was the first person to win the Nobel Prize twice  
 (D) She was born in Poland and died of Leukemia
045. Regarding Cemiplimab immunotherapy what is correct  
 (A) It is a monoclonal antibody that binds to PD-1 receptor  
 (B) It is used in recurrent cervical cancer resistant to platinum therapy  
 (C) It shows both OS and PFS advantage to chemotherapy alone  
 (D) All of the above
046. What is true about the Cyberknife?  
 (A) It has 6 degrees of freedom (B) Detects real time motion and correct it  
 (C) Used for SRS as well as SBRT (D) All of the above
047. Which is not a property of Ra-223 radionuclide?  
 (A) It is a gamma emitter  
 (B) It selectively targets bone metastasis  
 (C) It improves overall survival as compared to the placebo  
 (D) It is used to treat bone metastasis in Castration resistant prostate cancer
048. Mean dose for lung in a 3D-CRT plan as per QUANTEC, for a rate of symptomatic pneumonitis < 20% should be less than:  
 (A) 20 Gy (B) 25 Gy  
 (C) 30 Gy (D) 35 Gy
049. In the radical radiotherapy for carcinoma prostate, whole pelvic radiotherapy is done if the presumed risk of lymph node metastasis by Roach formulae is more than:  
 (A) 15% (B) 20%  
 (C) 25% (D) 30%

050. In the lymph node contouring for the pelvic malignancies, the contour of the inguinal lymph nodes should extend up to:
- (A) Crossing of Sartorius muscle with adductor longus  
 (B) 2 cm below Sapheno-femoral junction  
 (C) Lower edge of ischial tuberosity  
 (D) All of the above
051. Which of the following criteria does not fit under the “suitable” category as per the ASTRO guidelines for accelerated partial breast irradiation?
- (A) Age more than 50 years (B) Grade 3 tumours  
 (C) Estrogen receptor positive  (D) Margins < 2 mm
052. In Carcinoma Prostate the seminal vesicle involvement is predicted by:
- (A)  $PSA + ([Gleason-6] \times 10)$   (B)  $2/3 \times PSA + ([Gleason-6] \times 10)$   
 (C)  $3/2 \times PSA + ([Gleason-3] \times 10)$  (D)  $3/2 \times PSA + ([Gleason-6] \times 10)$
053. Which of the following is not correct?
- (A) LDR to HDR conversion factor is 0.54 (B) LDR to MDR conversion factor is 0.6  
 (C) MDR to HDR conversion factor is 0.9  (D) LDR to PDR conversion factor is 0.7
054. A 35-year-old man presents with large mediastinal lymph nodes, liver metastases and high LDH. Histology reveals undifferentiated tumour not further classifiable. What appropriate investigation should be performed?
- (A) PSA  (B) AFP  
 (C) CEA (D) Beta-2 microglobulin
055. As per ICRU 50 Guidelines, Hot spot is defined as an area outside PTV receiving > 100% dose in an area of diameter equal to or more than :
- (A) 5 mm diameter (B) 1 cm diameter  
 (C) 1.5 cm diameter (D) 2 cm diameter
056. As per the MACH-NC metaanalysis (2009) by Pignon et al, the absolute survival advantage with addition of concomitant chemotherapy in head and neck cancers is:
- (A) 4.5%  (B) 6.5%  
 (C) 8.0% (D) 8.5%
057. Which of the following best describes the tissue effects from radiation?
- (A) Early/acute effects typically occur within months after irradiation  
 (B) Large a/b ratio has a small “shoulder” in the low dose portion  
 (C) The frequencies of late effects depend strongly on radiation fraction size  
 (D) Typical human tumors and early responding tissues have a small a/b ratio
058. A 66 year old man presented with 4 cm left floor of mouth squamous cell carcinoma. He has a left sided 3 cm lymph node felt on examination and seen on CT. MRI shows that the primary tumor is invading in to the mandible. He has no evidence of distant metastasis on CT chest. What is the most appropriate therapy for this patient?
- (A) Radiation therapy alone  
 (B) Surgery alone  
 (C) Surgery followed by adjuvant radiation or chemo-radiation  
 (D) Concurrent chemoradiation followed by salvage surgery, if required

059. A 60 year old man with a 45 pack year history of smoking, presents with a central chest pain. Chest X-ray reveals a right upper lobe mass. CT scan of the chest demonstrates a 4 cm right upper lobe mass with right hilar and multiple Ipsilateral enlarged mediastinal nodes. Bronchoscopy and biopsy of the mass reveals NSCLC. His performance status is ECOG 0. Metastatic workup is normal. What would be the therapy of choice for him?
- (A) Definitive radiation to the chest  
 (B) Radiation to the chest followed by platinum based chemotherapy  
 (C) Platinum based doublet chemotherapy followed by radiation to chest  
 (D) Concurrent radiation to the chest and platinum based chemotherapy
060. Which one of the following is an adequate treatment for early stage favourable Hodgkins Lymphoma?
- (A) 4 cycles of ABVD  
 (B) 2 cycles of ABVD followed by IFRT 20 Gray  
 (C) 4 cycles of ABVD followed by IFRT 30 Gray  
 (D) 4-6 Cycles of ABVD followed by IFRT 20 Gray
061. A 69 year old male was recently diagnosed with adenocarcinoma of prostate and underwent radical prostatectomy. His baseline PSA was 26 ng/ml. The post-op histopathology revealed 2.5 × 2.5 cm tumor in right lobe of the prostate, Gleason's score 8 (4+4), extra prostatic extension with microscopic invasion of bladder neck, seminal vesicles were free and other structures were free of tumor. What would be the pathological T stage of this patients?
- (A) T3a (B) T3b  
 (C) T4 (D) T2c
062. Most common histo-pathology in carcinoma of unknown primary site is-
- (A) Squamous cell carcinoma  (B) Adenocarcinoma  
 (C) Neuro-endocrine carcinoma (D) Melanoma
063. 43-year-old man was diagnosed with a T2 N2 M0 nasopharyngeal carcinoma. Which of the following is the standard of care?
- (A) Platin/5-Fluorouracil (5-FU) based chemotherapy  
 (B) Surgical resection  
 (C) Concurrent chemo/RT followed by adjuvant chemotherapy  
 (D) Radiotherapy to Nasopharynx
064. A patient is undergoing chemotherapy for an adenocarcinoma of the left lung, 50 mm in its longest diameter, with a single liver metastasis 35 mm in its longest diameter. Following 2 cycles of treatment, the primary tumour shrinks down to 40 mm, and the liver metastasis to 30 mm. How would you categorise the response according to RECIST criteria?
- (A) Major response  (B) Stable disease  
 (C) Minor response (D) Not evaluable
065. A 62-year-old woman noted slight pressure in her right upper abdomen. On ultrasound she was found to have three liver lesions. Histologically they turned out to be a metastatic adenocarcinoma. Immunohistochemical staining showed the following pattern: CK7+, CK20-, TTF 1+. CT-imaging and endoscopic studies failed to detect a primary. Which is the most probable site of the primary tumour?
- (A) Colon (B) Breast  
 (C) Lung (D) Liver



066. The lifetime risk of developing ovarian cancer for a woman known to be a BRCA-1 carrier is approximately?
- (A) < 5% (B) 5-15 %  
 (C) 35-45% (D) 85-100 %
067. Which treatment option of the MAGIC trial for gastric cancer has shown a significant benefit in survival?
- (A) Induction chemotherapy followed by surgery  
 (B) Induction chemotherapy followed by surgery followed by adjuvant chemotherapy  
 (C) Primary surgery followed by adjuvant chemoradiotherapy  
 (D) Primary surgery followed by adjuvant chemotherapy
068. Which of the following symptoms is NOT seen in carcinoid syndrome?
- (A) Bronchoconstriction (B) Diarrhoea  
 (C) Flushing  (D) Hypertension
069. Prophylactic anticoagulation/prevention of VTE (venous thromboembolism) is recommended in all except-
- (A) Cancer patients undergoing major abdominal or pelvic surgery for up to 30 days  
 (B) Cancer patients with central venous catheter in situ  
 (C) Immobilized hospitalized cancer patients  
 (D) Myeloma patients receiving thalidomide/lenalidomide-based combination regimens
070. Which cancer may be treated with radioactive iodine?
- (A) Papillary carcinoma thyroid (B) Hurthle cell cancer  
 (C) Both (A) and (B) (D) Anaplastic thyroid carcinoma
071. Indication of post-operative radiotherapy along with chemotherapy in an operated case of Ca Cervix
- (A) Positive surgical margins  
 (B) Pathologically confirmed involvement of the pelvic lymph nodes  
 (C) Microscopic involvement of the parametrium  
 (D) All of the above
072. Which of the following is an advantage of HDR brachytherapy?
- (A) Radiobiological advantage (B) Cost effectiveness  
 (C) Special room requirement  (D) Need of hospitalization
073. Which among the following is the least cardiotoxic drug?
- (A) Trastuzumab  (B) Pertuzumab  
 (C) Doxorubicin (D) Cyclophosphamide
074. Early detection of Cervical cancer with Pap smear comes under which level of prevention?
- (A) Primordial prevention (B) Primary prevention  
 (C) Secondary prevention (D) Tertiary prevention

075. Regarding Immunotherapy related side effect what is not correct-
- (A) Side effects can manifest as skin toxicity, hypothyroidism and other endocrine disorder
  - (B) For grade 3 skin reactions, steroids should be used
  - (C) Immunotherapy should be permanently discontinued for grade 3 or above reactions
  - (D) Generally, occur within 3 months after initiation of ICPi treatment
076. What is not correct regarding Deauville criteria?
- (A) DLBCL patients who demonstrate a complete metabolic response (Deauville 1) but have a residual mass of greater than 2 cm are at an increased risk of recurrence
  - (B) It is a 5 point score
  - (C) Tumor uptake is compared to the uptake in kidney
  - (D) Used for assessing treatment response of lymphoma
077. The most commonly used biologically active molecule for PET scanning is a fluoridated analog of which of the following:
- (A) Phosphate
  - (B) Glucose
  - (C) Calcium
  - (D) Albumin
078. Bortezomib inhibits the activity of:
- (A) VEGF
  - (B) Proteasomes
  - (C) Kit
  - (D) m-ToR
079. Which of the following statements is TRUE concerning the DAHANCA trial testing the effectiveness of nimorazole with radiotherapy for the treatment of supraglottic and pharyngeal tumors?
- (A) Nimorazole radiosensitizes through depletion of natural sulfhydryl compounds present in the cell
  - (B) No significant improvement was noted with respect to either loco-regional tumor control or disease-free survival
  - (C) Nimorazole has greater radiosensitizing efficiency than other compounds in its chemical class
  - (D) The toxicity produced by nimorazole was relatively mild.
080. Which of these not a scale to measure performance score ?
- (A) KPS
  - (B) ECOG
  - (C) Zubrod
  - (D) RTOG
081. With a patient in head-first supine position, an antero-posterior beam is delivered on a linear accelerator using International electro-technical Commission (IEC) standards. What is the gantry angle?
- (A) 0 degree
  - (B) 90 degree
  - (C) 180 degree
  - (D) 270 degree
082. More monitor units are required in IMRT in comparison to 3D-CRT. Why?
- (A) Dose per fraction is higher for IMRT
  - (B) Higher beam energy is used for IMRT
  - (C) IMRT employs more fields
  - (D) Large portions of the field are blocked in IMRT

083. A woman was diagnosed with Right sided ovarian mass with papillary serous histology. Post-surgery there was a 2.5 cm left ovarian mass with implants on fallopian tube and 2 Rt pelvic lymph nodes and 2 Rt inguinal lymph nodes were positive. What is the stage?
- (A) II (B) I  
 (C) IV (D) III
084. Which histology has most favourable outcome in breast cancer?
- (A) Apocrine (B) Pleomorphic lobular  
 (C) Medullary (D) Metaplastic
085. According to the RTOG breast cancer contouring atlas, what is included in the chest wall CTV for a patient receiving PMRT?
- (A) Mastectomy scar plus chest wall excluding pectoralis muscles and ribs  
 (B) Mastectomy scar plus chest wall including pectoralis muscles and excluding ribs  
 (C) Mastectomy scar plus chest wall including pectoralis muscles and ribs and excluding Latissimus dorsi muscle  
 (D) Mastectomy scar plus chest wall including pectoralis muscles ribs and latissimus dorsi
086. Cisplatin has all the following properties except?
- (A) It is used as a radiosensitizer with concurrent radiotherapy  
 (B) It is cell-cycle nonspecific drug  
 (C) It is similar in efficacy to its isomer, trans-platinum  
 (D) It causes both inter strand and intra-stand crosslinking
087. What is the primary goal of phase IV trial?
- (A) Determine MTD  
 (B) Obtain FDA approval  
 (C) Post approval assessment of safety and effectiveness  
 (D) Investigate off-label indications
088. Regarding follow-up of breast cancer patients after adjuvant therapy, according to ESMO guidelines, what is recommended?
- (A) Mammography every year  
 (B) Chest X-ray, liver ultrasound and bone scan annually for 5 years  
 (C) Annual breast MRI for 5 years  
 (D) Regular blood counts and biochemistry every 5 years
089. A 55-year-old man is diagnosed with a gastrointestinal stromal tumour of the stomach metastatic to the liver. Molecular analysis reveals an activating mutation in exon 9 of the KIT gene. Which of the following treatments should you recommend as first line treatment?
- (A) Imatinib 400 mg once daily  (B) Imatinib 400 mg twice daily  
 (C) Regorafenib 160 mg daily (D) Sorafenib 400 mg twice daily
090. A 65-year-old man undergoes surgical excision of a right temporal anaplastic oligodendroglioma. Post-operatively, in addition to radiation, which biomarker suggests increased benefit from chemotherapy (i.e. PCV regimen)?
- (A) 1p/19q chromosomal codeletion (B) PTEN loss  
 (C) Methylation of the MGMT promoter (D) None of the above

091. Which dose of dexamethasone corresponds (is equivalent) to 100 mg prednisone?  
 (A) 2 mg (B) 6 mg  
 (C) 16 mg (D) 100 mg
092. A 26-year-old man, consuming 3 alcoholic beverages/day, presented with lung-and retroperitoneal metastases of a non-seminoma testis. AFP serum level at the start of BEP chemotherapy was 1000 µg/l. Five days after the start of the chemotherapy the serum level was 1300 µg/l. Which is the most likely explanation for this finding?  
 (A) Hepatotoxicity due to the combination of alcohol use and treatment  
 (B) Hepatotoxicity due to the treatment  
 (C) Transient elevation of AFP due to tumour lysis  
 (D) Progressive disease
093. What is abscopal effect ?  
 (A) Localised response following SBRT  
 (B) Synergistic effect at the irradiated site  
 (C) Systemic effects of immunosuppression  
 (D) Therapeutic effect at distance from irradiated site
094. Which of the following is the least likely side effect related to the use of cisplatin?  
 (A) Anaemia (B) Hearing loss  
 (C) Neutropenia (D) Tinnitus
095. Isotopes have the same number of \_\_\_\_\_ and different number of \_\_\_\_\_.  
 (A) Neutrons, protons (B) Electrons, neutrons  
 (C) Protons, neutrons (D) Neutrons, electrons
096. Which ICRU report was written regarding the dose and volume specification as well as reporting Intracavitary Brachytherapy in Gynec cancers  
 (A) ICRU 34  (B) ICRU 38  
 (C) ICRU 36 (D) ICRU 32
097. Preferred first line systemic therapy in HCC for patients ineligible to receive TKI with Child Pugh class B is  
 (A) Atezolizumab (B) Lenvatinib  
 (C) Nivolumab (D) Pembrolizumab
098. One of the following is not an ideal candidate for SBRT of Pancreas  
 (A) Tumor size > 3 cm (B) Encasement of Superior Mesenteric Artery  
 (C) Infiltration of bowel (D) None of the above
099. Which of the following pathways has been implicated in cell death after exposure to ionizing radiation ?  
 (A) Autophagy (B) Apoptosis  
 (C) Necrosis  (D) Mitotic catastrophe
100. What volume accounts for the patient's physiologic movement, such as breathing?  
 (A) Clinical target volume  (B) Internal margin  
 (C) Gross target volume (D) Motion volume

101. A 41-year-old male presents with a 6-month history of nasal congestion, right ear fullness, and bilateral palpable neck masses. Clinicoradiologic assessment and biopsies confirm a stage IVB nasopharynx cancer. He is otherwise healthy with excellent performance status. What would be the optimal treatment approach?
- (A) Chemoradiation with/without adjuvant chemotherapy  
 (B) Surgery with adjuvant radiation  
 (C) Surgery alone  
 (D) Radiation alone
102. Your patient is a 35-year-old man with recently diagnosed medullary thyroid carcinoma. During his initial history and physical examination, the patient reports that there are numerous family members who have been diagnosed with thyroid cancer and pheochromocytoma. Mutations of which of the following genes are most likely to be identified in this patient with genetic testing?
- (A) RAS  (B) RET  
 (C) PPAR- $\gamma$ 1  (D) BRAF
103. What is the relationship between Sievert (Sv) and rem?
- (A) 1 Sv = 100 rem  (B) 1 Sv = 100 mrem  
 (C) 1 mSv = 100 rem  (D) 1 mSv = 1 mrem
104. Which one of the following lung cancers is more strongly associated with smoking?
- (A) Epidermoid cancer  (B) Bronchoalveolar  
 (C) Small cell lung cancer  (D) Adenocarcinoma
105. Which of the following parameters is not used in the Van Nuys Prognostic Index?
- (A) Size  (B) Grade  
 (C) Surgical margin  (D) Hormone receptor status
106. What is the clinical nodal stage of a breast cancer patient with ipsilateral internal mammary lymph node (+) with no axillary lymph node?
- (A) N1  (B) N2a  
 (C) N2b  (D) N3a
107. Which of the following brain tumors cannot metastasize outside the CNS?
- (A) Hemangiopericytoma  (B) Medulloblastoma  
 (C) Oligodendroglioma  (D) Ependymoma
108. Which of the following parts enables synchronized injection of electrons and microwaves into an accelerator tube?
- (A) Klystron  (B) Magnetron  
 (C) Modulator  (D) Electron gun
109. What is the maximum allowable dose limit per year for the normal population?
- (A) 1 mSv  (B) 5 mSv  
 (C) 10 mSv  (D) 20 mSv

110. Deletion of 1p and 19q in oligodendroglioma is associated with:
- (A) Better response to therapy but similar progression-free and overall survival
  - (B) Better response to therapy with improved progression-free but similar overall survival
  - (C) Similar response to therapy with improved progression-free and overall survival
  - (D) Better response to therapy with improved progression-free and overall survival
111. Presence of para-aortic LNs is classified under which stage for carcinoma cervix
- (A) Stage II
  - (B) Stage IIIA
  - (C) Stage IIIB
  - (D) Stage IIIC
112. Which of the following is the rectal tolerance dose during the application of HDR intracavitary brachytherapy?
- (A) 80% of the A point dose
  - (B) 80% of the B point dose
  - (C) 90% of the A point dose
  - (D) 90% of the B point dose
113. Which of the following regions is the most common site for prostate cancer?
- (A) Peripheral region
  - (B) Central zone
  - (C) Fibromuscular stroma
  - (D) Transitional zone
114. Which of the following is not recommended in the management of stage I seminoma?
- (A) Postoperative para-aortic radiotherapy
  - (B) Postoperative surveillance
  - (C) Scrotal orchiectomy
  - (D) One to two cycles of carboplatin postoperatively
115. Which of the following medications are necessary to help minimize hematologic toxicities with pemetrexed and pralatrexate?
- (A) Vitamin B6 and Vitamin B12
  - (B) Folic acid and dexamethasone
  - (C) Vitamin B12 and folic acid
  - (D) Folinic acid and Vitamin B6
116. Which of the following lymphoma is most likely to have CNS involvement:
- (A) Burkitt's Lymphoma
  - (B) DLBCL
  - (C) Hodgkin's Lymphoma
  - (D) Lymphoplasmacytic Lymphoma
117. A 65-year-old man with a 40 pack-year history of smoking, presents to the emergency room with shortness of breath. Chest radiograph demonstrates a left lower lobe mass and left pleural effusion. CT reveals a 3-cm left lower lobe mass, left hilar fullness, and a moderate left pleural effusion. Biopsy of the mass and thoracentesis are both positive for adenocarcinoma. Staging studies do not reveal any distant metastases. Which of the following is the next best step in his management?
- (A) Referral to a thoracic surgeon
  - (B) Radiation to the chest
  - (C) Concurrent chemotherapy and radiation
  - (D) Platinum-based doublet therapy

118. A 45-year-old woman has undergone surgical resection followed by adjuvant chemotherapy (Paclitaxel + Carboplatin + Bevacizumab) for her stage IIIC ovarian cancer. She is now in complete remission. What is the next step in further treatment to reduce the risk of recurrent disease?
- (A) Maintenance treatment with single agent paclitaxel for 12 months.  
 (B) Clinical surveillance.  
 (C) Maintenance treatment with single agent topotecan.  
 (D) Maintenance treatment with bevacizumab and/or PARPi.
119. A 20-year-old man presents with right knee pain. X-ray reveals a “sunburst” appearance in the distal femur. Biopsy reveals high-grade osteosarcoma. No distant metastases are identified. Which of the following is the most appropriate treatment?
- (A) Limb-sparing resection  
 (B) Limb-sparing resection and adjuvant chemotherapy  
 (C) Definitive radiation  
 (D) Neoadjuvant chemotherapy, limb-sparing resection, and adjuvant chemotherapy
120. All cancer predisposition syndromes listed below have a dominant mode of inheritance, EXCEPT:
- (A) Neurofibromatosis type I                      (B) Xeroderma pigmentosum  
 (C) Peutz-Jeghers syndrome                      (D) Multiple endocrine neoplasia (MEN) 2
121. In Tumor Lysis Syndrome, which is not seen?
- (A) Hyperkalemia                                      (B) Hypocalcemia  
 (C) Hypophosphatemia                              (D) Hyperuricaemia
122. Patients with MEN1 syndrome are predisposed to developing all of the following endocrine tumors, EXCEPT:
- (A) Parathyroid adenoma                              (B) Pancreatic islet cell tumor  
 (C) Pheochromocytoma                              (D) Pituitary adenoma
123. What threshold is used to define critical weight loss in patients with cancer?
- (A) 10% of baseline body weight in 6 months                      (B) 10% of lean body mass in 6 months  
 (C) 10% of baseline body weight in 3 months                      (D) 10 lbs in 1 month
124. Which of the following medications are effective as adjuvants in treating neuropathic pain?
- (A) Tricyclic antidepressants                      (B) Anticonvulsants  
 (C) Local anesthetics                                      (D) All of the above
125. Complete surgical staging of uterine cancer does not include which one of the following procedures:
- (A) Bilateral salpingo-oophorectomy                      (B) Pelvic washings  
 (C) Pelvic lymphadenectomies                      (D) Omentectomy
126. At a radiation dose of above 100 Gy death occurs within 48 hrs of exposure. What is the mode of death?
- (A) Bone Marrow Death                                      (B) Prodromal Syndrome  
 (C) Cerebrovascular syndrome                      (D) Gastro-intestinal syndrome

127. What is the value of Optimal LET with respect to RBE?  
 (A) 100 KeV/um (B) 200 KeV/um  
 (C) 150 KeV/um (D) 300 KeV/um
128. What are the factors that determine RBE?  
 (A) Radiation Quality (B) Radiation dose and fractionation  
 (C) Dose rate (D) All of the above
129. Radio-protective drug approved by FDA for prevention of xerostomia:  
 (A) WR-2721 (B) WR-638  
 (C) MEA (D) MEA-PO3
130. In terms of radiation-induced damage to mammalian cells, the most important radiolysis products of water are:  
 (A) Hydrogen atoms (B) Superoxide radicals  
 (C) Hydrogen peroxide (D) Hydroxyl radicals
131. A 48-year-old man with a history of peptic ulcer disease presented to his gastroenterologist with persistent abdominal pain. He underwent an esophagogastroduodenoscopy, which showed a 2.5-cm gastric lesion. Biopsy was taken from this lesion. The pathology was consistent with well-differentiated neuroendocrine tumor. The patient has normal gastrin level. A staging CT showed no other suspicious lesions. What is the next step in management?  
 (A) Start octreotide  
 (B) Observe  
 (C) Perform endoscopic resection  
 (D) Perform radical resection of tumor with regional lymphadenectomy
132. Photons hit the outer orbital electron, and the photon and electron scatter in different directions at a certain angle. This phenomenon is called :  
 (A) Coherent scattering (B) Pair production  
 (C) Compton effect (D) Photodisintegration
133. Which of the following megavoltage therapy machines produces only particle ionizing radiation?  
 (A) Van De Graaf generator (B) Betatron  
 (C) Microtron (D) Cyclotron
134. Where is the light emitted from TLDs after heating?  
 (A) Conduction band (B) Valance band  
 (C) Traps in a forbidden zone (D) Both (A) and (B)
135. Which of the following is not correct for the bolus?  
 (A) It is used for tissue compensation.  
 (B) It is put on the skin at a right angle to the beam axis.  
 (C) It is made up of tissue-equivalent density material.  
 (D) The effect of scattered radiation reaching to the skin decreases with bolus use.
136. As the energy of a particulate type of radiation increases, the LET tends to:  
 (A) Increase (B) Frst increase and then decrease  
 (C) First decrease and then increase (D) Decrease



137. Which one of the following proteins is involved in the induction of apoptosis following irradiation?
- (A) p53 (B) Survivin  
(C) EGFR (D) PI-3K
138. Which of the following organs are affected in the presence of Lhermitte's sign?
- (A) Brain (B) Peripheral nerves  
(C) Brachial plexus (D) Spinal cord
139. An update of MARCH Meta-analysis, including data from 33 trials, shows an absolute difference in overall survival benefits in hyperfractionated group at 5 years of:
- (A) 6.0% (B) 3.4%  
(C) 8.1% (D) 4.6%
140. Which of the following is a prognostic factor in high-grade glial tumors?
- (A) Age (B) Tumor size  
(C) Extent of surgery (D) All of the above
141. In the International Commission of Radiation Units (ICRU) Report 62, internal organ motion is separately accounted for by the
- (A) Internal target volume (B) Planning target volume  
(C) Planning organ at risk volume (D) Clinical target volume.
142. Which of the following types of nasopharyngeal cancer are less frequently associated with EBV?
- (A) Keratinized squamous cell carcinoma (B) Nonkeratinized carcinoma  
(C) Undifferentiated carcinoma (D) None of the above
143. Which of the following is not localized in the supraglottic larynx?
- (A) Epiglottis (B) Arytenoids  
(C) Rima glottidis (D) Aryepiglottic folds
144. Which lymphatic levels are recommended to be electively included in node negative early T stage anterior oral cavity cancers?
- (A) II, III and IV (B) I, II and III  
(C) I, II, III and retropharyngeal LN (D) I, II, III and IV
145. What is Ohngren's line?
- (A) A virtual line between the lateral canthus and the mandibular angle  
(B) A virtual line between the medial canthus and the mandibular angle  
(C) A virtual line between the medial canthus and the tragus  
(D) A virtual line between the lateral canthus and the tragus
146. Which of the following is the most common malignant salivary gland tumor of the parotid gland?
- (A) Warthin's tumor (B) Pleomorphic adenoma  
(C) Mucoepidermoid cancer (D) Adenoid cystic cancer

147. A syndrome observed in superior sulcus tumors invading the costa. Symptoms include lower brachial plexopathy and shoulder pain. This syndrome is called :
- (A) Horner syndrome (B) Pancoast tumor  
(C) Eaton-Lambert syndrome (D) Superior Vena Cava syndrome
148. What is the recommended schedule for SCLC prophylactic cranial radiotherapy (total dose/dose per fraction)?
- (A) 25 Gy/2.5 Gy (B) 24 Gy/2 Gy  
(C) 30 Gy/3 Gy (D) 40 Gy/2 Gy
149. Which of the following is not used in the staging of STSs?
- (A) Grade (B) Tumor size  
(C) Fascial invasion (D) Surgical margin
150. Which of the following is an unfavourable risk factor for advanced Hodgkin Lymphomas?
- (A) Male gender (B) Hemoglobin level of 12 g/dl  
(C) Albumin level of 5 g/dl (D) Age younger than 45 years
151. The phase of the cell cycle that exhibits the greatest resistance to ionizing radiation is:
- (A) M (B) G1  
(C) Early S (D) Late S
152. Antimetabolite chemotherapeutic agents include all of the following, EXCEPT:
- (A) Gemcitabine (B) Fluoropyrimidines  
(C) Mitoxantrone (D) Cytarabine
153. The arithmetical average of a number of observations is called:
- (A) Mean (B) Median  
(C) Range (D) All of the above
154. Best measure of central tendency in an highly skewed distribution is:
- (A) Mean (B) Median  
(C) Range (D) Mode
155. The correlation coefficient can range from:
- (A) 0 to +1 (B) 0 to -1  
(C) +1 to -1 (D) 0 to 100
156. A healthy 13-year-old girl received a vaccine against human papilloma virus (HPV). This is an example of:
- (A) Primary prevention (B) Secondary prevention  
(C) Tertiary prevention (D) Case finding
157. Which germ cell tumor is associated with widespread hematogenous metastases and high levels of human chorionic gonadotropin (HCG)?
- (A) Choriocarcinoma (B) Yolk sac tumor  
(C) Embryonal carcinoma (D) Seminoma
158. Crizotinib has activity against which of the following mutations :
- (A) ALK (B) ROS1  
(C) MET (D) All of the above

159. For fractionated radiotherapy, each successive dose to the tumor results in the death of:
- (A) Progressively fewer cells
  - (B) Progressively more cells
  - (C) Approximately the same number of cells
  - (D) A variable number of cells
160. If a patient of advanced NSCLC, no targetable driver mutation is found and PD-L1 expression is  $\geq 50\%$ , which of the following will be the treatment approach :
- (A) Pembrolizumab
  - (B) Pembrolizumab plus single agent platinum
  - (C) Pembrolizumab plus platinum based doublet chemotherapy
  - (D) All of the above
161. All are true regarding FLASH Radiotherapy Except:
- (A) Uses Ultra High dose rate radiation
  - (B) Proposed Mechanism of action is acute oxygen depletion in irradiated tissue.
  - (C) Initial pre-clinical studies have shown reduce radiation-induced toxicities whilst maintaining an equivalent tumor response.
  - (D) FLASH therapy is widely used in humans in clinical practice to treat several deep seated malignancies.
162. In a conventional fractionation pattern, a head and neck cancer is treated to a total of 70 Gy in 35 fractions, given one fraction per day, 5 days a week. (assuming an b/a of 10 Gy)? What is the BED for the tumor
- (A) 60 Gy<sub>10</sub>
  - (B) 70 Gy<sub>10</sub>
  - (C) 80 Gy<sub>10</sub>
  - (D) 84 Gy<sub>10</sub>
163. All of the following are acceptable components of treatment for radiation induced pneumonitis except:
- (A) Prednisone prescribed at 1 mg/kg/day over a slow taper
  - (B) Prednisone 60 mg/day over a slow taper
  - (C) Trimethoprim-sulfamethoxazole
  - (D) Metronidazole
164. What was the pathological complete response rate in those that underwent neoadjuvant chemoradiation in the CROSS trial?
- (A) 10%
  - (B) 20%
  - (C) 30%
  - (D) 35 %
165. Which is the most common site of distant metastasis for renal cell carcinoma?
- (A) Bone
  - (B) Brain
  - (C) Liver
  - (D) Lung
166. What is the most appropriate therapy for a noninvasive bladder tumor?
- (A) Neoadjuvant chemotherapy, followed by TURBT
  - (B) Neoadjuvant chemoradiation, followed by TURBT
  - (C) TURBT followed by intravesicular chemotherapy
  - (D) TURBT followed by chemoradiation

167. Elements with same number of nucleons but different number of protons are called  
 (A) Isotopes (B) Isotones  
 (C) Isobars (D) Isomers
168. Which type of target is used in megavoltage X-ray tube accelerator?  
 (A) Flattening filter (B) Transmission – type target  
 (C) Reflection – type target (D) Filtration
169. Which of the following material will attenuate more of an incoming photon beam in Compton interaction?  
 (A) Bone (B) Soft tissue  
 (C) Hydrogen (D) Water
170. What is the normal request for PTV in terms of prescription in an IMRT plan?  
 (A) 100% of PTV is covered with 100% of prescription dose.  
 (B) 100% of PTV is covered with 95% of prescription dose.  
 (C) 95% of PTV is covered with 100% of prescription dose.  
 (D) 95% of PTV is covered with 95% of prescription dose.
171. TD 5/5 refers to:  
 (A) The minimum tolerance dose that causes a 5% complication rate within 5 years of radiation completion  
 (B) The maximum tolerance dose that causes a 5% complication rate within 5 years of radiation completion  
 (C) The total dose that causes 5% of population to die within 5 years of radiation completion.  
 (D) The Time delay that takes 5% of cell population to duplicate in 5 years.
172. Which of the following is not true regarding non-stochastic late effects?  
 (A) Occurs after a threshold dose is passed.  
 (B) Severity of effect is proportional to dose.  
 (C) Probability of effect occurring is proportionate to dose.  
 (D) Also referred as a deterministic effect.
173. How does the human papillomavirus promote carcinogenesis?  
 (A) E7 protein binds p53; E6 protein binds Rb.  
 (B) E6 protein binds p53; E7 protein binds Rb.  
 (C) E6 protein promotes p16 expression.  
 (D) None of the above.
174. All of the following are included in the radiation treatment volume of locally advanced T4 nasopharynx carcinoma except:  
 (A) Posterior two thirds of the maxillary sinus  
 (B) Sphenoid sinus  
 (C) Base of skull  
 (D) Posterior one third of the nasal cavity

175. Which is not true regarding the RTOG 90-03 trial of altered fractionation?  
 (A) The majority of patients had oropharyngeal cancer.  
 (B) This was a three-arm trial: standard versus split-course accelerated versus hyperfractionation.  
 (C) There was no overall survival difference between any of the arms.  
 (D) Acute toxicity was worse in the altered fractionation arms.
176. What is the incidence of “skip metastases” in squamous cell carcinoma of the oral tongue?  
 (A) 5% (B) 10%  
 (C) 15% (D) 20%
177. Which of the molecular subtype descriptions is incorrect?  
 (A) Luminal A: ER/PR positive, Her2neu negative  
 (B) Luminal B: ER/PR positive, Her2neu positive  
 (C) Basal-like: ER/PR negative, Her2neu positive  
 (D) Basal-like: ER/PR negative, Her2neu negative
178. Which of the following is not an indication for postoperative chemoradiation after surgery for cervical cancer?  
 (A) Tumor size > 4 cm (B) Positive margins  
 (C) Parametrial involvement (D) Lymph node positivity
179. Botryoid tumors commonly occur in all of the following sites, except:  
 (A) Extremity (B) Genitourinary region  
 (C) Nasopharynx (D) External auditory canal
180. Lymphocyte-predominant Hodgkin lymphoma is most frequently characterized by the following typical immunophenotype:  
 (A) CD20+, CD45+, CD3-, CD15-, CD30-  
 (B) CD20+, CD45-, CD3-, CD15+, CD30+  
 (C) CD20-, CD45+, CD3+, CD15-, CD30+  
 (D) CD20-, CD45-, CD3+, CD15+, CD30-
181. Photoelectric mass attenuation coefficient is proportional to:  
 (A)  $Z.E$  (B)  $Z^2.E^2$   
 (C)  $Z^3.E^3$  (D)  $Z^3.E^{-3}$
182. What is exposure?  
 (A) The transmission of radiation through the edge of the collimator blocks  
 (B) Used to bent the electron beam 90 or 270 degree from its original path  
 (C) Measure of ionization produced per unit mass on air  
 (D) The energy absorbed in a material per unit mass.
183. What are the first echelon lymph nodes for vulvar cancer?  
 (A) Inguinal (B) Deep femoral  
 (C) External iliac (D) Para-aortic
184. A squamous cell carcinoma that arises out of a chronic burn is:  
 (A) Erythroplasia of Queyrat (B) Bowen’s disease  
 (C) Gorlin’s tumor (D) Marjolin’s ulcer

185. Olaparib was approved by the FDA in:
- (A) Germline BRCA-positive , HER2-negative metastatic breast cancer in patients who have previously received chemotherapy in the neoadjuvant, adjuvant, or metastatic settings
  - (B) Germline BRCA-negative , HER2-negative metastatic breast cancer in patients who have previously received chemotherapy in the neoadjuvant, adjuvant, or metastatic settings
  - (C) Germline or somatic BRCA-Positive , HER2-negative metastatic breast cancer in patients who have previously received chemotherapy in the neoadjuvant, adjuvant, or metastatic settings
  - (D) Germline BRCA-Positive , HER2-negative metastatic breast cancer in patients who have never previously received chemotherapy in the neoadjuvant, adjuvant, or metastatic setting
186. All of the following are options for breast cancer risk reduction in women at high-risk except:
- (A) Tamoxifen in premenopausal women aged 20 years and older
  - (B) Tamoxifen in postmenopausal women
  - (C) Exemestane in postmenopausal women
  - (D) Raloxifene in postmenopausal women
187. Which of the following is not a second generation EGFR TKI used in NSCLC
- (A) Afatinib
  - (B) Erlotinib
  - (C) Dacomitinib
  - (D) All are second generation
188. Choose the WRONG combination of drug and its main target
- (A) Exemestane, aromatase inhibitor
  - (B) Dactinomycin, DNA polymerase inhibitor
  - (C) Etoposide, Topoisomerase II
  - (D) Pentostatin, RNA polymerase inhibitor
189. A circle divided into sectors proportional to the frequency of items shown is called as:
- (A) Histogram
  - (B) Pie chart
  - (C) Bar chart
  - (D) Frequency polygon
190. The most likely mechanism for hyperthermia-induced cell killing is:
- (A) Direct damage to cellular RNA
  - (B) Protein denaturation
  - (C) Sugar degradation
  - (D) Inhibition of anabolic metabolism
191. In the SOFT and TEXT studies all of the following subgroup of breast cancer patients experienced reduced recurrence rates with ovarian suppression, except :
- (A) Patients younger than 35 years
  - (B) Higher stages of breast cancer requiring chemotherapy
  - (C) Patients who became menopausal with chemotherapy
  - (D) Patients having positive axillary nodes
192. As filtration increases, the X-ray beam has:
- (A) Higher average energy and lower penetrating power.
  - (B) Lower average energy and greater penetrating power.
  - (C) Higher average energy and greater penetrating power.
  - (D) Lower average energy and lower penetrating power.

193. 58-year-old man is diagnosed with a glioblastoma of the left occipital lobe. He undergoes gross total resection. Molecular studies demonstrate that the tumor is O-methylguanine methyltransferase unmethylated. His performance status is 90%. He has a right visual field defect. What would be the recommended treatment for this patient?
- (A) Radiation with concomitant temozolomide followed by adjuvant temozolomide (Stupp regimen)
- (B) Radiation alone
- (C) Radiation plus temozolomide plus bevacizumab
- (D) Hypofractionated radiotherapy plus temozolomide
194. The most radiosensitive phase of cell cycle is:
- (A) G1 (B) S
- (C) G2 (D) M
195. The following is NOT a criterion for the diagnosis of multiple myeloma
- (A) Plasma cells in Bone Marrow > 30% (B) Bence Jones protein
- (C) Decreased  $\beta$ 2 microglobulin (D) Lytic bone lesion
196. A 45-year-old man with long-standing gastroesophageal reflux undergoes upper endoscopy that reveals patchy areas of epithelium resembling gastric mucosa extending 5 cm proximal to the oesophagogastric junction. Biopsies are obtained. The pathological report describes "Barrett's oesophagus". Which of the following processes does this finding represent?
- (A) Atrophy (B) Carcinoma *in situ*
- (C) Hyperplasia (D) Metaplasia
197. Which skin condition is premalignant?
- (A) Seborrhoeic keratosis (B) Actinic keratosis
- (C) Blue naevus (D) Strawberry naevus
198. Characteristic presenting features of left sided colorectal tumours include:
- (A) acute large bowel obstruction.
- (B) iron deficiency anaemia
- (C) painless abdominal mass.
- (D) foul smelling stools which are difficult to flush.
199. In metastatic prostate cancer:
- (A) Median survival is 18 months
- (B) Hormone therapy will produce responses in around 70% of men with bone metastases
- (C) The median response duration of hormone therapy is 8 months
- (D) Chemotherapy is the most common systemic treatment used
200. The term "stochastic" is used to describe a radiation effect in which the:
- (A) Probability of occurrence is a function of time post-irradiation
- (B) Severity of the effect depends on the dose above a tissue/organ specific threshold
- (C) Probability of occurrence increases with dose, with no apparent threshold
- (D) Normal tissue tolerance is exceeded