

पुस्तिका में पृष्ठों की संख्या : 40

Number of Pages in Booklet : 40

पुस्तिका में प्रश्नों की संख्या : 180

No. of Questions in Booklet : 180

प्रश्न-पत्र पुस्तिका संख्या /

Question Paper Booklet No.

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SUBJECT: Medical Oncology

परीक्षा दिनांक :- 13/08/2020

समय : 3.00 घण्टे

Time : 3.00 Hours

परीक्षा समय :- 2:00 To 5:00

अधिकतम अंक : 180

Maximum Marks : 180

प्रश्न-पत्र पुस्तिका एवं उत्तर पत्रक के पेपर सील/पॉलिथीन बैग को खोलने के बाद परीक्षार्थी प्रश्न-पत्र पुस्तिका संख्या को उत्तर पत्रक पर सावधानीपूर्वक अंकित करें। इसमें किसी भी प्रकार की त्रुटि होने पर जिम्मेदारी अभ्यर्थी की होगी।

The candidate fill the Question Paper Booklet No. on Answer Sheet carefully after opening the Paper Seal / Polythene bag. Candidate himself shall be responsible for any error.

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-पत्र 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 सावधानीपूर्वक सही भरें। गलत अथवा अपूर्ण रोल नम्बर भरने पर 5 अंक कुल प्राप्तियों में से काटे जा सकते हैं।

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.

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.

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1. A 52-year-old man presented with haemoptysis, weight loss, worsening breathlessness and retro-sternal chest pain. He was a lifelong heavy smoker. His ECOG Performance Status was '1'. His chest X-ray was abnormal. A CT scan of chest and abdomen demonstrated a large mass in the right lower lobe invading into the mediastinum and pericardium, extensive mediastinal lymphadenopathy, and bone metastasis (T4, N3, M1b). Bronchoscopy and biopsy confirmed a squamous cell carcinoma. Mutation analysis revealed that EGFR and K-ras genes were both wild type. What is the most appropriate first-line therapy?

- (1) docetaxel
- (2) gefitinib
- (3) pemetrexed and cisplatin
- (4) gemcitabine and cisplatin

2. A 28-year-old man presented with a painless swelling in the right testis and an ultrasound scan & FNAC confirmed the presence of a malignant mass. Following high right orchidectomy, he was found to have a 40-mm seminomatous germ cell tumour without non-seminomatous components. There was evidence of vascular invasion within the testis. Investigations:

- serum lactate dehydrogenase (LDH) 1250 U/L (10-250)
- serum α -fetoprotein normal
- serum (β -human chorionic gonadotrophin (HCG) 700 U/L (<5)
- A CT scan of body showed retroperitoneal lymphadenopathy of up to 7 cm in size, a 3-cm mediastinal lymph node and over 30 pulmonary metastases. There were no signs of liver, brain or bone metastases.

What is the most appropriate International Germ Cell Cancer Collaborative Group classification?

- (1) good prognosis because of the absence of liver, bone and brain metastases
- (2) good prognosis because of the raised HCG and LDH
- (3) intermediate prognosis because of the raised serum HCG and LDH
- (4) poor prognosis because of the raised serum HCG and LDH

3. A 58-year-old, post-menopausal woman presented with back pain. She had no other symptoms. Fourteen years previously, she had undergone a mastectomy and axillary node clearance for a T2, NO, MO, grade 3, ER positive, HER2 negative breast cancer. This had been followed by six cycles of adjuvant cyclophosphamide, doxorubicin and 5-fluorouracil (CAF) chemotherapy and 5 years of tamoxifen. Her ECOG performance status was '1'. Physical examination was normal. Investigations:

- full blood count normal
- serum alkaline phosphatase 325 U/L (45-105)
- all other liver, renal and bone biochemistry normal
- CT scan of chest and liver five lung metastases (largest 25 mm in diameter); solitary 1-cm metastasis in left lobe of liver
- isotope bone scan multiple hot spots throughout dorsal and lumbar spine

In addition to a bisphosphonate, what is the most appropriate systemic therapy ?

- (1) anthracycline-based chemotherapy
- (2) taxane-based chemotherapy
- (3) aromatase inhibitor
- (4) CDK 4/6 Inhibitor plus aromatase inhibitor

4. A 68-year-old woman was being given cetuximab as part of treatment for advanced colon cancer. She developed a maculopapular acneiform rash with inflammation and pustules. This involved her face, shoulders, upper limbs, chest and back. She had difficulty dressing as a result, but there was no pruritus and it was not tender to touch. What is the most appropriate management ?

- (1) continue cetuximab and treat with topical antibiotics
- (2) interrupt cetuximab and treat with emollient
- (3) interrupt cetuximab and treat with systemic antibiotics
- (4) interrupt cetuximab and treat with topical antibiotics

5. A 1-year-old boy developed bilateral retinoblastomas. Following surgical treatment he was referred to the hospital cancer genetics unit. His parents were very concerned that his 4-year-old sister would also develop this condition. What is the mode of inheritance of mutations of the Rb gene ?

- (1) autosomal dominant
- (2) autosomal recessive
- (3) mitochondrial
- (4) X-linked recessive

6. A 64-year-old man presented with severe haematemesis and melaena requiring emergency blood transfusion. Investigations showed a c-kit positive gastrointestinal stromal tumour arising from the fundus of the stomach. A CT scan showed a 6-cm tumour, but no metastases. What is the most appropriate management ?

- (1) downstaging with imatinib followed by appropriate surgery
- (2) downstaging with imatinib followed by appropriate surgery, and a further 2 years of imatinib
- (3) gastrectomy
- (4) imatinib monotherapy

7. A 67-year-old man presented with dysphagia and weight loss. Endoscopy and biopsy showed a grade 3 adenocarcinoma beginning at 30 cm from the incisors, extending for 2 cm with the oesophagogastric junction at 40 cm. An endoscopic ultrasound scan suggested invasion into, but not through, the lamina propria and no involved lymph nodes. A CT scan of chest and abdomen and FDG-PET-CT scan showed no other sites of disease. What is the best estimate of the stage of disease ?

- (1) Ia
- (2) Ib
- (3) Ic
- (4) IIa

8. A 52-year-old woman presented with increased abdominal distension and constipation. She had been treated 18 months previously with a total abdominal hysterectomy and bilateral salpingo-oophorectomy followed by carboplatin and paclitaxel for a stage IIIc serous ovarian adenocarcinoma. She had shown a complete radiological and biochemical response.

Investigations:

serum carcinoembryonic antigen: 18 µg/L (<10)

serum CA 125: 2130 U/mL (<35)

CT scan of chest, abdomen and pelvis: splenic metastases; omental caking; ascites

What is the most appropriate second-line chemotherapy regimen ?

- (1) carboplatin and liposomal doxorubicin
- (2) carboplatin and paclitaxel
- (3) liposomal doxorubicin
- (4) paclitaxel

9. A 79-year-old man presented to his general practitioner with lower urinary tract symptoms. Over the past 2 years he had noticed worsening urinary frequency and nocturia of up to six times per night. On digital rectal examination, he had a very large, benign-feeling prostate. His serum prostate-specific antigen was 9.81 µg/L (<4). He proceeded to a transurethral resection of the prostate (TURP) and 62 g of tissue was resected. The pathologist detected a Gleason score 6 (3+3) prostatic adenocarcinoma in <5% of the prostatic chippings. Consequently, he underwent a postoperative MR scan of pelvis, which showed a prostate volume of 92 ml, a large resection cavity, no obvious residual cancer and no pelvic lymphadenopathy. What is the most appropriate management strategy ?

- (1) active surveillance
- (2) brachytherapy
- (3) radical prostatectomy
- (4) external beam radiotherapy

10. A 65-year-old woman had undergone surgery for a grade 2, T2, N1, ER positive, HER2 negative carcinoma of the breast. After six cycles of adjuvant fluorouracil, epirubicin, cyclophosphamide (FEC) chemotherapy she started taking anastrozole. A baseline bone mineral density test showed mild osteopenia (T score = -1.2). She had no other major risk factors for osteoporotic fracture. In addition to lifestyle advice, what is the most appropriate management?
- (1) add a calcium and vitamin D supplement
 - (2) add an oral bisphosphonate
 - (3) add tamoxifen to anastrozole
 - (4) switch anastrozole to tamoxifen
11. The cyclin responsible for facilitating the progress of the cell into and through mitosis is:
- (1) Cyclin A
 - (2) Cyclin B
 - (3) Cyclin D
 - (4) Cyclin E
12. Select the FALSE statement regarding microRNAs?
- (1) microRNAs encode protein kinases that regulate cell cycle.
 - (2) They regulate mRNA expression.
 - (3) There is at least five clusters of microRNAs targeting mRNA that encodes cell-cycle regulatory proteins.
 - (4) miR-15a/16 cluster targets cyclin E1 and cyclin D1.
13. RAF is inhibited by which of these therapeutic agents that induce apoptosis?
- (1) Sorafenib
 - (2) Imatinib mesylate
 - (3) Bortezomib
 - (4) Taxanes
14. The Warburg effect describes:
- (1) Exponential cell growth in response to an exogenous stimulant.
 - (2) Inefficient energy production by most cancer cells, resulting in rapid adenosine triphosphate (ATP) depletion and necrotic cell death.
 - (3) Initiation of neoplasia requires two somatic mutations for initiation of sporadic neoplasms and hereditary neoplasms require a genetic plus a somatic mutation.
 - (4) Sculpting of normal human tissues as a result of cell death.
15. The stochastic model of tumor heterogeneity is best described as:
- (1) Every cell has equal potential to initiate and sustain tumor growth, but most cells do not proliferate extensively because of the low cumulative probability of permissive events.
 - (2) Cancer stem cells (CSCs) are biologically distinct from the bulk cell population, which does not possess tumor-initiating activity.
 - (3) Tumors are heterogeneous secondary to random, acquired mutations.
 - (4) Tumors are pressured into heterogeneity by variable pressures applied to the tumor.

16. Which of the following is TRUE with regard to genetic mutations in cancer ?
- (1) Gain-of-function mutations (oncogenes) are generally dominant at the cellular level.
 - (2) Loss-of-functions mutations (tumor suppressor genes) are generally recessive at the cellular level.
 - (3) Ninety percent of germ line mutations in familial cancer syndromes are in tumor suppressor genes.
 - (4) All of the above.
17. Which of the following best describes the term "proto-oncogene" ?
- (1) A normal cellular gene that has been transduced by a retrovirus that is then mutated following viral replication.
 - (2) A homologue of a known oncogenic element identified in prehistoric specimens.
 - (3) A transforming viral gene that can cause malignant transformation in fibroblasts in vitro.
 - (4) A viral oncogene that, following infection, is the direct causative agent of human cancer.
18. Which one of the following statement is CORRECT with regard to molecular profiling using gene arrays and proteomics ?
- (1) Gene arrays can predict protein-protein interactions.
 - (2) Protein levels and protein function do not correspond directly with gene transcript levels.
 - (3) Polymerase chain reaction can be used to amplify biopsy material for use in gene arrays, whereas no signal amplification technology is standard in protein arrays.
 - (4) All of the above
19. The presence of mutations in p53 has been associated with which of the following properties on cells:
- (1) Loss of the G2 checkpoint following treatment with DNA-damaging agents
 - (2) Enhanced capacity to undergo apoptosis following exposure to radiation
 - (3) Increased capacity for DNA amplification
 - (4) 1. and 3.
20. Which of the following syndromes are associated with abnormalities in the double-strand repair ?
- (1) Xeroderma pigmentosum
 - (2) Fanconi anemia
 - (3) Lynch syndrome
 - (4) Bloom syndrome

21. Which of the following is CORRECT about cohort studies ?
- (1) Cohort studies only follow subjects prospectively
 - (2) Subjects are free of disease at the time of study entry
 - (3) The incidence of the disease in the exposed group is compared to members of the
 - (4) general population who have been matched for selected characteristic
22. Confounding factors and interaction (also known as effect modification) are common in epidemiologic studies. Which of the following statements is TRUE in regards to confounding and interaction ?
- (1) Confounder is not associated with exposure
 - (2) Confounder is associated with the disease and dependent on the exposure
 - (3) Confounder may be an intermediate step between exposure and disease
 - (4) Confounder is not a true relationship and interaction is true relationship between an exposure and disease
23. Potential weaknesses in case-control studies include:
- (1) Selection biases related to choosing and enrolling subjects
 - (2) Recall biases related to previous exposures
 - (3) Cases may not be representative of disease
 - (4) All of the above
24. Dr. Mathur wishes to study the relationship between diet tobacco consumption and the development of gastric cancer. He selects the cases of gastric cancer detected over the last 15 years, and then to obtain his controls he selects for patients who referred to the gastroenterology clinic. This is as an example of:
- (1) Information bias
 - (2) Selection bias
 - (3) Misclassification bias
 - (4) All of the above
25. Which of the following cancer is decreasing in incidence in India ?
- (1) Cervical cancer
 - (2) Prostate cancer
 - (3) Breast cancer
 - (4) Lung cancer
26. Which of the following is TRUE regarding cigarette smoking causing cancer ?
- (1) DNA adducts caused by carcinogens in cigarette smoke are responsible for mutations that can eventually cause cancer.
 - (2) Nicotine can reduce apoptosis and promote angiogenesis.
 - (3) Compounds that promote inflammation may play a role in cancer development
 - (4) All of the above

27. The HPV vaccine Gardasil

- (1) Is a quadrivalent vaccine containing virus-like particles (VLPs) from four different types of HPV.
- (2) Protects from all HPV-causing cervical cancer.
- (3) Is recommended only for sexually active women.
- (4) Is recommended for treating cervical cancer.

28. The role of EBV in cancer is characterized by the following:

- (1) EBV DNA is present in the tumor of all Burkitt lymphoma patients.
- (2) EBV is universally present in all CNS lymphomas in AIDS patients.
- (3) Nasopharyngeal carcinoma is the only nonlymphoid malignancy associated with EBV.
- (4) Involvement in all Hodgkin lymphoma

29. Examples of chemical carcinogens include

- (1) Benzene has been linked to myelodysplastic syndrome and acute myeloid leukemia.
- (2) Heterocyclic amines are associated with breast and colon cancer.
- (3) Aryl aromatic amines found in tobacco smoke and in dyes have been associated with bladder cancer.
- (4) All of the above.

30. Obesity and physical activity are associated with following cancers:

- (1) Obesity but not low physical activity is associated with risk of colon cancer.
- (2) Obesity is not a risk factor for endometrial cancer.
- (3) Higher lifetime physical activity is associated with lower risk for pancreatic cancer.
- (4) Obesity lowers the risk of gallbladder cancer.

31. In analyzing a randomized controlled trial of a screening test which is the best indicator of effectiveness ?

- (1) Absolute reduction in mortality
- (2) Evidence of stage shift
- (3) Increased 5-year survival
- (4) Relative reduction in mortality

32. Which statement regarding screening for breast cancer is TRUE ?

- (1) The monthly breast self-examination (BSE) is a crucial component of breast cancer screening programs.
- (2) The BSE has been shown to be ineffective for breast cancer screening.
- (3) Increasing the interval of mammographic screening from 1 year to 2 years results in a halving of the mortality benefit.
- (4) Mammography has a higher positive predictive value (PPV) for women aged 40 to 49 as compared with women aged 50 to 59.

33. A 19-year-old woman presents for a health maintenance visit. She has been sexually active for 4 years and has had one episode of chlamydia. What is the recommended approach to cervical cancer screening for her ?
- (1) Begin annual screening with cervical cytology (Pap smear) plus HPV cotesting.
 - (2) Begin annual screening with cervical cytology alone.
 - (3) No cervical cancer screening at this time; start screening at age 21 with cervical cytology alone.
 - (4) No cervical cancer screening at this time; start screening at age 21 with cervical cytology and HPV cotesting every 3 years.
34. Which of the following CRC screening tests can directly prevent colorectal cancer ?
- (1) CT colonography (“virtual colonoscopy”)
 - (2) Fecal immunochemical testing (FIT)
 - (3) High-sensitivity fecal occult blood testing (FOBT)
 - (4) Optical colonoscopy (endoscopy)
35. Which of the following screening tests for Lung Cancer has been proven to be successful and is being used routinely in some countries ?
- (1) Chest X-rays of all subjects above age 50
 - (2) HRCT Chest scans of all smokers (>30 pack/yr)
 - (3) Low-dose Chest CT scans of high risk subjects
 - (4) Chest X-ray & CT Scan of all smokers (>30 pack/yr)
36. Which of the following statement is TRUE ?
- (1) Continued smoking after the diagnosis of localized prostate cancer does not increase the risk of recurrence.
 - (2) The adverse effect of smoking is not acutely reversible. Therefore smoking cessation is not recommended before surgical resection for esophageal cancer.
 - (3) Current smoking does not increase the risk of postoperative death in lung cancer patients undergoing surgery.
 - (4) Current smoking increases the toxicities associated with radiotherapy in patients with head and neck cancer.
37. In clinical trials, systemic retinoids and beta carotene were shown to reduce cancer incidence in this group of high-risk individuals
- (1) Skin cancer in patients with xeroderma pigmentosum
 - (2) Lung cancer in heavy smokers
 - (3) Cervical cancer in patients with cervical dysplasia
 - (4) Colorectal cancer in patients with adenoma

38. Which of the statements is TRUE regarding nonsteroidal anti-inflammatory drugs (NSAIDs) in the prevention of colorectal cancer ?
- (1) Chemopreventive effects of low-dose aspirin on colorectal cancer development were demonstrated in clinical trials, and its overall benefits outweigh the risks in adults at average risks of developing colorectal cancer.
 - (2) High-dose sulindac prevents the development of new polyps, although it does not cause the regression of established polyps.
 - (3) In randomized trials, both rofecoxib and celecoxib were shown to reduce the risk of metachronous colorectal adenomas and colorectal cancer.
 - (4) Considering the risks associated with these agents, screening strategy alone is recommended in average-risk adults
39. *Helicobacter pylori* infection is associated with increased risk of which of the following ?
- (1) Esophageal adenocarcinoma
 - (2) Gastric cardia carcinoma
 - (3) Esophageal squamous cell carcinoma
 - (4) Intestinal-type gastric adenocarcinoma
40. What is TRUE regarding the risk of endometrial cancer for patients with Lynch syndrome ?
- (1) The risk for women with Lynch syndrome varies from 20% to 60% and is higher than development of ovarian cancer.
 - (2) Clinically, these cancers are frequently poorly differentiated, present at an advanced stage, and associated with poor prognosis.
 - (3) Risk reducing hysterectomy should be performed shortly after menarche.
 - (4) Estrogen replacement is contraindicated in women with Lynch syndrome undergoing bilateral salpingo-oophorectomy
41. Which of the following statements regarding prophylactic oophorectomy is TRUE ?
- (1) Prophylactic bilateral salpingo-oophorectomy (BSO) is the most effective therapy to reduce the risk of ovarian cancer in women with BRCA1 or BRCA2 gene mutation.
 - (2) BSO in BRCA1 or BRCA2 gene mutation carriers is indicated at age 30.
 - (3) BSO in BRCA1 or BRCA2 gene mutation carriers has no effect on the risk of developing breast cancer.
 - (4) All the above

42. Which of the following malignancies does NOT have a significant increase in incidence among people with Lynch syndrome ?
- (1) Colon cancer
 - (2) Cervical cancer
 - (3) Ovarian cancer
 - (4) Endometrial cancer
43. A 28-year-old woman with bilateral ductal cancer presents to the medical oncologist for assessment and treatment. Her medical history is notable for intussusception at 6 years of age. On her physical examination, the medicine resident notices small blue/black hyperpigmented macules on her lips, buccal mucosa, and fingertips. What is her diagnosis ?
- (1) Hereditary BRCA1 syndrome
 - (2) Li-Fraumeni syndrome
 - (3) Peutz-Jeghers syndrome
 - (4) Cowden syndrome
44. Which of the following statements regarding people with a BRCA1 or BRCA2 gene mutation are TRUE ?
- (1) The majority of BRCA1 gene mutation carriers who develop breast cancer develop estrogen receptor-positive breast tumors, and BRCA2 gene mutation carriers most often develop estrogen receptor-negative breast tumors.
 - (2) BRCA1 and BRCA2 gene mutation carriers have an increased risk to develop pancreatic cancer.
 - (3) BRCA2 gene mutations are associated with an increased risk for follicular thyroid cancer
 - (4) Prophylactic bilateral mastectomy decreases the risk of breast cancer by about 50% among women with a BRCA1 or BRCA2 gene mutation.
45. Which of the following scenarios best identifies a prognostic marker ?
- (1) KRAS mutation testing in setting of colon cancer
 - (2) Dihydropyrimidine dehydrogenase (DPD) deficiency in the setting of 5-FU therapy
 - (3) MMR protein expression deficiency in setting of colon cancer
 - (4) UGT1A1*28 polymorphism in setting of irinotecan therapy
46. Which of the following is CORRECT regarding hemorrhagic cystitis ?
- (1) Bladder protection with mesna is required for all patients receiving cyclophosphamide
 - (2) Hemorrhagic cystitis is caused by indirect damage to the bladder wall by either cyclophosphamide or ifosfamide
 - (3) Mesna works by providing a free sulfhydryl group that binds to toxic metabolites
 - (4) Mesna should be given in divided doses to total 100% of the total alkylating agent dose
47. Which of the following statement is CORRECT regarding anthracycline cardiotoxicity ?
- (1) Acute doxorubicin cardiotoxicity is irreversible, and its incidence can be reduced by increasing infusion rates.
 - (2) Chronic and delayed anthracycline cardiotoxicity is more common and severe because it is irreversible.
 - (3) The incidence of cardiomyopathy secondary to anthracyclines is only related to the cumulative dose.
 - (4) Available evidence suggests the superiority of (β-blocker use to prevent anthracycline Cardiotoxicity

48. Which of the following is a principle of epigenetic therapy ?
- (1) Epigenetic changes cause alterations in the sequencing of targeted genes.
 - (2) Epigenetic therapy is mostly utilized and has the greatest efficacy in solid tumors.
 - (3) The impact of epigenetic therapy is not seen immediately due to efficacy being based on cellular reprogramming.
 - (4) Combination therapy with HDAC inhibitors and demethylating agents should not be pursued due to overlapping toxicities
49. Asparaginase is commonly used in combination with methotrexate as part of acute lymphoblastic leukemia treatment protocols. Which of the following statement regarding administration of these drugs is TRUE ?
- (1) Asparaginase should be given concurrently with methotrexate in order to inhibit methotrexate's clearance and increase its cytotoxicity.
 - (2) Asparaginase should be given immediately before methotrexate in order to decrease the risk of methotrexate neurotoxicity.
 - (3) Asparaginase should be given 12 hours before methotrexate in order to prime cancer cells for methotrexate's antimetabolite activity.
 - (4) Asparaginase and methotrexate should be given sequentially at least 24 hours apart secondary to methotrexate antagonism
50. Which of the following statements regarding anti-angiogenesis agents is CORRECT ?
- (1) Lenalidomide was the first angiogenesis inhibitor approved by the FDA for cancer treatment.
 - (2) Vorinostat, celecoxib, and bortezomib may all be referred to as exclusive angiogenesis inhibitors.
 - (3) Proangiogenic factors include endostatin, angiostatin, and thrombospondin.
 - (4) Resistance to vascular endothelial growth factor inhibitors has been seen secondary to increased expression of proangiogenic factors
51. Which of the following types of immunity is most responsible for the host response to tumor development ?
- (1) Humoral immunity
 - (2) B-cell-mediated immunity
 - (3) T-cell-mediated immunity
 - (4) Antibody-mediated immunity
52. Which of the following is an approach to cancer immunotherapy ?
- (1) Passive transfer of activated immune cells with antitumor activity
 - (2) Active immunization to enhance antitumor reactions
 - (3) Nonspecific stimulation of immune reactions
 - (4) All of the above

53. Which of the following is an example of an immunotherapy that works by nonspecific stimulation of immune reactions, and in which disease has it shown to be effective ?
- (1) Cancer vaccine in hepatocellular carcinoma
 - (2) Adoptive immunotherapy in lung cancer
 - (3) IL-2 in melanoma
 - (4) Anti-CTLA4 in pancreatic cancer
54. The purpose of checkpoint molecules such as CTLA-4 and PD-1 are to:
- (1) Enhance the immune response against infectious agents by activating T cells.
 - (2) Enhance the immune response against cancer by activating T cells.
 - (3) Protect normal tissues against autoimmunity by inhibiting T cells.
 - (4) Protect normal tissues from tumorigenesis by stimulating the immune system
55. Which is TRUE regarding cancer vaccines ?
- (1) Cancer vaccines have a high rate of efficacy but their use is limited due to toxicity
 - (2) Cancer vaccines have a high rate of efficacy and are currently used in multiple tumor types to induce tumor regression.
 - (3) Cancer vaccines have a low rate of efficacy because of their inability to generate antitumor T cells
 - (4) Cancer vaccines have a low rate of efficacy despite their ability to generate antitumor T Cells
56. Which of the following is CORRECT regarding adoptive cell therapy ?
- (1) Adoptive cell therapy is only effective if the lymphocytes are genetically modified prior to infusing them into the patient.
 - (2) Both non-viral- and viral-based gene delivery platforms have been used to genetically modify cells for use in adoptive cell therapy
 - (3) Targeting antigens that are expressed only on tumor cells and not on normal tissue can decrease the toxicity associated with on-target, off-tumor effects of the lymphocytes
 - (4) (2) and (3) only
57. Which of the following drug acts on a targeted mutation ?
- (1) Docetaxel
 - (2) Navelbine
 - (3) Erlotinib
 - (4) Pemetrexed
58. Which of the following drug is an antimetabolite chemotherapeutic agent ?
- (1) Gemcitabine
 - (2) Temozolomide
 - (3) Mitoxantrone
 - (4) Bevacizumab
59. Which of the following play essential role in activating apoptosis ?
- (1) Bcl-2
 - (2) NF-kB
 - (3) Caspases
 - (4) Bcl-xL

60. According to RECIST criteria 1.1, a partial response is defined as:
- (1) At least a 30% reduction in measurable tumor mass.
 - (2) At least a 10% reduction in measurable tumor mass.
 - (3) Improvement in quality of life.
 - (4) Improvement in survival
61. Anticancer activity of bortezomib is due to the inhibition of:
- (1) Proteasome.
 - (2) Bcl-2.
 - (3) Thymidylate synthase.
 - (4) MDM2
62. Dose-dense chemotherapy was developed after the observation that:
- (1) The growth of cells is significantly lower in the early part of the growth curve.
 - (2) The log cell kill is higher in smaller volume tumors, resulting in more rapid growth between chemotherapy cycles.
 - (3) Growth between chemotherapy cycles is halted.
 - (4) More frequent administration of chemotherapy led to less toxicity.
63. Which of the following is TRUE concerning p53 ?
- (1) It is a targetable mutation for therapy
 - (2) It is a potent inducer of apoptosis.
 - (3) It causes S-phase arrest in the cell cycle.
 - (4) It can decrease the activity of cytotoxic chemotherapy
64. Which of the following is a non-measurable lesion, according to RECIST criteria ?
- (1) 3.5 cm × 2.0 cm pancreatic adenocarcinoma
 - (2) 1.7 cm × 1.5 cm invasive ductal carcinoma of the breast
 - (3) 0.8 cm × 0.7 cm right paratracheal lymph node
 - (4) 5.5 cm × 4.0 cm rectal adenocarcinoma
65. Which of the following is TRUE regarding the use of time to progression as an end point in clinical trials ?
- (1) Uses a smaller sample size when compared with using overall survival as an end point.
 - (2) Not confounded by subsequent therapies.
 - (3) The study can be completed in a shorter amount of time.
 - (4) All of the above
66. Which of the following is TRUE concerning a clinical trial ?
- (1) The sample size of a clinical trial is fixed and determined before the trial begins.
 - (2) Clinical trials are prospectively planned experiments involving only animals.
 - (3) Using tumor registry data to compare the survival rates of prostate cancer patients treated with surgery to those of patients who received radiotherapy is an example of clinical trial.
 - (4) Clinical trials test a clearly stated hypothesis using a predefined analysis plan

67. Phase I trials of cytotoxic agents are designed to determine a dose that is appropriate for use in phase II trials. Which of the following statements is TRUE about phase-I trials ?

- (1) Phase I trials involve the first use of a drug, device, or procedure in humans in a new disease setting or a new combination of therapies.
- (2) Patients for phase I trials are usually *not* chosen on the basis of their likelihood of having a favorable response to the experimental treatment.
- (3) Phase I trials do not require statistical justification because the sample sizes are usually small.
- (4) (1) and (2)

68. A drug, device, or other treatment may be considered for phase II testing when:

- (1) The maximum tolerable dose is known but there is genuine doubt about efficacy and patients with the condition of interest and a likely favourable outcome can be recruited as study participants.
- (2) A standard treatment exists for comparison.
- (3) Accrual is rapid enough to allow recruitment of 20 to 30 patients.
- (4) An appropriate control group can be recruited at the same time as the experimental group

69. Which of the following best describes Simon phase 2.5 design on molecularly targeted drugs and cancer therapeutic vaccines ?

- (1) The design compares progression-free survival times of the same patient from the current trial with his/her previous trial.
- (2) The design first treats all eligible patients with two to four courses of the experimental drugs. Patients are then evaluated, and the experimental drug is either continued or discontinued, depending on their response to the initial treatment.
- (3) The design is similar to a phase III trial except that it allows a relatively large type I (false positive) error and aims to identify a relatively large difference, thus requiring fewer patients.
- (4) The design will compare time to progression of patients in the study with a prospectively identified and prognostically comparable historical control

70. Which of the following is TRUE of phase III trials ?

- (1) The primary end points should be demonstrably related to patient benefit such as tumor shrinkage.
- (2) Eligibility criteria should be limited to a group of patients with certain conditions.
- (3) Conditions of treatment should be suited to community patient care.
- (4) A quality-of-life measure should be included to measure benefit to patients

71. Which of the following statements about the epidermal growth factor receptor (EGFR) in head and neck SCC (HNSCC) is TRUE ?

- (1) Randomized trials demonstrated that oral tyrosine kinase inhibitors (TKI) of EGFR such as erlotinib and monoclonal antibody inhibitors of EGFR such as cetuximab resulted in similar tumor control.
- (2) Activating EGFR mutations are frequent in HNSCC.
- (3) The EGFR inhibitor cetuximab improved overall survival when added to definitive radiation therapy or to palliative platinum-based chemotherapy in HNSCC.
- (4) High EGFR expression is associated with sensitivity to radiation therapy

72. Which of the following characteristics are typical features of human papilloma virus (HPV)-related HNSCC ?

- (1) Most patients have limited or no smoking history and most have primary tumors that involve the oropharynx (base of tongue or palatine tonsils).
- (2) Survival outcomes are substantially better than in patients with smoking-associated HNSCC.
- (3) The role of the HPV in subsites other than the oropharynx is not clear.
- (4) All of the above.

73. Which of the following statements is TRUE ?

- (1) Radical neck dissections should be performed for the management of all locally advanced HNSCC.
- (2) Complications from neck dissections may include hematoma, seroma, lymphedema, wound infections and dehiscence, carotid artery exposure and rupture, and damage to the VII, X, XI, and XII cranial nerves.
- (3) In a surgically treated tumor without radiographic evidence of lymph node metastasis, an elective neck dissection should be performed if the risk of occult metastasis to the neck nodes is greater than 50%.
- (4) For patients who have had a neck dissection for HNSCC, there is no benefit from postoperative adjuvant radiation therapy

74. Which of the following statements is TRUE ?

- (1) The combination of cisplatin and 5FU improves overall survival in comparison to single agent methotrexate in patients with metastatic HNSCC.
- (2) Cetuximab has no activity in metastatic or recurrent HNSCC.
- (3) The combination of cisplatin and 5FU results in a higher tumor response rate than single-agent methotrexate in patients with metastatic HNSCC.
- (4) Higher chemotherapy doses improve overall survival

75. Which of the following statements regarding induction chemotherapy in the treatment of HNSCC is TRUE ?

- (1) Treatment with concurrent chemotherapy and radiation therapy resulted in improved overall survival compared to induction chemotherapy followed by radiation therapy for locally advanced laryngeal SCC.
- (2) Addition of docetaxel to cisplatin and 5FU was associated with similar overall survival when compared to cisplatin and 5FU in patients with locally advanced HNSCC subsequently treated with radiation therapy alone or concurrent carboplatin and radiation therapy.
- (3) Induction chemotherapy may facilitate organ preservation in patients with locally advanced laryngeal or hypopharyngeal SCC.
- (4) Induction chemotherapy followed by concurrent cisplatin and radiation therapy results in improved overall survival compared to concurrent cisplatin and radiation therapy.

76. A 40-year-old never-smoker woman was diagnosed with adenocarcinoma of the lung a year ago. Molecular testing of her tumor revealed an exon 19 deletion in EGFR. She was started on erlotinib and had a partial response. However, her most recent scan suggested significant progression in her disease burden with multiple new liver and lung metastases. Her tumor was rebiopsied.

Which of the following alterations is most likely to explain the tumor's resistance to erlotinib ?

- (1) L858R
- (2) MET amplification
- (3) T790M
- (4) The biopsy is likely to reveal transdifferentiation to small cell lung cancer (SCLC).

77. Sequencing the lung adenocarcinoma of a 54-year-old man with a 60 pack-year smoking history is likely to reveal which of the following features ?

- (1) EML4-ALK translocation
- (2) An excess of C>T transitions
- (3) Co-mutation of TP53 and RB1
- (4) An excess of G>T transversions

78. A 55-year-old man with a 30 pack-year history of smoking, presents to the emergency room with shortness of breath. Chest radiograph demonstrates a right upper lobe opacity. Computed tomography (CT) scan reveals a 3.5-cm spiculated mass in the peripheral right upper lobe, which is suspicious for malignancy, without any hilar or mediastinal lymphadenopathy. What is the next best step in management ?
- (1) Bronchoscopy and biopsy of the mass
 - (2) CT-guided biopsy of the mass
 - (3) Brain MRI
 - (4) Refer to thoracic surgeon for resection.
79. 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 ?
- (1) Referral to a thoracic surgeon
 - (2) Radiation to the chest
 - (3) Concurrent chemotherapy and radiation
 - (4) Platinum-based doublet therapy
80. A 58-year-old man, with a 40 pack-year history of smoking is referred to you by a radiation oncologist for management of limited-stage SCLC. What treatment would you recommend ?
- (1) Cisplatin and etoposide chemotherapy
 - (2) Cisplatin and etoposide chemotherapy with concurrent thoracic radiation
 - (3) Cisplatin and etoposide chemotherapy, followed by PCI if response to chemotherapy
 - (4) Cisplatin and etoposide chemotherapy with concurrent thoracic radiation, followed by PCI if response to treatment
81. Which of the following statement is CORRECT regarding the role of adjuvant chemotherapy after resection for NSCLC ?
- (1) Adjuvant chemotherapy benefits patients with stage IA disease.
 - (2) Adjuvant chemotherapy benefits patients with node-positive disease.
 - (3) Adjuvant chemotherapy may benefit patients with stage IB disease, who have primary tumors less than 4 cm in size.
 - (4) All of the above.
82. Which of the following statements is CORRECT regarding pulmonary carcinoid tumors ?
- (1) Patients usually present with carcinoid syndrome.
 - (2) Surgery has a curative potential for resectable localized tumors.
 - (3) Adjuvant chemotherapy is the standard of care following complete surgical resection.
 - (4) Most pulmonary carcinoids are atypical carcinoids

83. Which of the following is a characteristic genomic feature of small cell lung cancer ?

- (1) Recurrent alterations in EGFR and ALK
- (2) Recurrent alterations in TP53 and RB1
- (3) Recurrent mutations in DDR2
- (4) Recurrent KRAS mutations.

84. Which of the following immunohistochemistry markers is present in malignant mesotheliomas ?

- (1) CEA
- (2) TTF-1
- (3) Moc-31
- (4) Calretinin

85. A 60-year-old man was recently diagnosed with metastatic pleural mesothelioma. Assuming that this patient has no other significant comorbidities, which of the following chemotherapy regimens would be most preferable in the first-line setting ?

- (1) Cisplatin and gemcitabine
- (2) Carboplatin and gemcitabine
- (3) Single agent pemetrexed
- (4) Cisplatin and pemetrexed

86. Which of the following statements regarding thymoma is TRUE ?

- (1) The incidence of thymoma is higher in women than in men.
- (2) Thymoma is most commonly seen in people under 30 years old.
- (3) The most common site of metastatic spread for thymoma is bone.
- (4) Complete surgical resection is the most important predictor of long-term survival for patients with thymoma.

87. Which of the following molecularly targeted therapies has meaningful clinical activity in advanced thymoma ?

- (1) Octreotide, a somatostatin analog
- (2) Erlotinib, an EGFR inhibitor
- (3) Imatinib, a c-kit inhibitor
- (4) Sorafenib, a multitargeted kinase inhibitor

88. A 21-year-old man presents with anterior chest pain and cough. Physical examination is unremarkable and his performance status is excellent. Chest radiography shows widening of the superior mediastinum. CT scan shows a 6-cm anterior mediastinal mass encasing the trachea and great vessels and three 1-cm pulmonary nodules. CT scan of the abdomen and pelvis and a testicular ultrasound examination are normal. Laboratory studies reveal normal blood counts and blood chemistry, LDH of 880 IU/L (normal, 120 to 240 IU/L), AFP of 1,800 ng/mL (normal, <8 ng/mL), and (β -hCG of 1.2 mIU/mL (normal, <5 mIU/mL). What is the most likely diagnosis ?

- (1) Hodgkin lymphoma
- (2) Benign teratoma
- (3) Nonseminomatous germ cell tumor (NSGCT)
- (4) Seminoma



89. Which of the following statements is TRUE regarding mediastinal germ cell tumors ?

- (1) The incidence of malignant mediastinal germ cell tumors is the same in men and women.
- (2) Seminoma is the most common mediastinal germ cell tumor.
- (3) An elevated serum AFP in a patient with biopsy-proven seminoma indicates the presence of a non-seminomatous component.
- (4) Mediastinal NSGCTs are associated with better overall survival than testicular NSGCTs

90. Which of the following is TRUE for mediastinal germ cell tumors according to the International Germ Cell Consensus Classification (IGCCC) ?

- (1) All pure mediastinal seminomas are good risk
- (2) All mediastinal non-seminomatous germ cell tumors are poor risk
- (3) Pure mediastinal seminomas with non-pulmonary visceral metastases are poor risk
- (4) Mediastinal non-seminomatous germ cell tumors without visceral metastases are intermediate risk

91. Which of the following is TRUE for cancer of the esophagus ?

- (1) Adenocarcinoma has a better outcome compared to squamous cell carcinoma of the esophagus.
- (2) HER2+ over expression is an adverse prognostic factor similar to breast cancer.
- (3) The incidence of esophageal cancer is higher in African-American compared to Caucasian men.
- (4) The lifetime risk of being diagnosed with esophageal cancer is 1%.

92. Which of the following statement about the molecular biology of esophageal cancer is TRUE ?

- (1) EGFR over expression correlates with poor prognosis including poor response to chemotherapy.
- (2) Presence of p53 point mutation correlates with response to induction chemotherapy and predicts survival after esophagectomy.
- (3) Reduced expression of E-cadherin correlates with progression from Barrett esophagus to dysplasia and finally to adenocarcinoma.
- (4) All of above

93. Which of the following syndrome is usually associated with intestinal type of gastric cancer ?

- (1) Lynch syndrome
- (2) Li-Fraumeni syndrome
- (3) Familial adenomatous polyposis syndrome
- (4) Peutz-Jeghers syndrome

94. Which of the following gene mutations is associated with the highest gastric cancer risks ?

- (1) BRCA1/2
- (2) P53
- (3) CDH1
- (4) APC

95. A 48-year-old male who was diagnosed with adenocarcinoma of the stomach underwent partial gastrectomy. PET-CT prior to surgery shows no evidence of distant disease. He had 1 of 18 lymph nodes removed involved with cancer. Margins were negative for cancer. The pathologic stage is IIB (T3 N1 tumor). He was referred to you to discuss adjuvant treatment options. He has an ECOG performance status of '1'. What is the best treatment modality ?

- (1) Chemotherapy with Carboplatin and Paclitaxel
- (2) There is no evidence for benefit from adjuvant treatment in this case.
- (3) 5FU and leucovorin, followed by 45 Gy in 25 fractions plus concurrent 5FU and leucovorin.
- (4) Check for HER2 over expression and if positive, treat with cisplatin/5FU plus trastuzumab.

96. Which of the following statements regarding pancreatic cancer is TRUE ?

- (1) At diagnosis, about one-third have evidence of distant metastases.
- (2) Activation of the KRAS oncogene plus inactivation of tumor suppressor genes (TP53, DPC4, p16, and BRCA 2) are associated with the development of pancreatic cancer.
- (3) Pancreatic intraepithelial neoplasms (PanINs) are intraductal proliferative epithelial lesions that will not progress to pancreatic cancer.
- (4) Patients with advanced pancreatic cancer will have high levels of CA 19-9 if they are Lewis antigen-a or-b negative.

97. A 71-year-old woman undergoes Whipple resection for a T3N1M0 pancreatic adenocarcinoma. Postoperative recovery was uneventful, and she starts adjuvant therapy 7 weeks later with gemcitabine given intravenously weekly for 3 weeks, followed by a 1-week break. In a follow-up visit after her first cycle, she reports a 5-lb weight loss, nausea, decreased appetite, and diarrhoea with floating stools. What should be done next ?

- (1) Increase pancreatic enzyme supplementation
- (2) Admit the patient for small bowel obstruction
- (3) Hold chemotherapy for 1 week and follow up on symptoms
- (4) CT scan of the chest, abdomen, and pelvis to rule out metastatic disease



98. A 45-year-old man with unintentional weight loss is diagnosed with metastatic adenocarcinoma of the pancreas. Which of the following chemotherapy regimens would be appropriate first-line treatment choice in this otherwise healthy patient with normal organ function ?
- (1) Gemcitabine
 - (2) FOLFIRINOX (5FU, leucovorin, irinotecan, and oxaliplatin)
 - (3) 5FU with radiation
 - (4) FOLFOX (5FU + leucovorin + oxaliplatin)
99. Which one of the following statements about adjuvant therapy for biliary cancers is TRUE ?
- (1) Based on retrospective data it appears patients may benefit from adjuvant chemotherapy.
 - (2) Adjuvant radiation is superior to chemotherapy alone.
 - (3) Adjuvant therapy can improve overall survival for patients with RO resections.
 - (4) Fluoropyrimidine-based chemoradiation is standard because it is superior to radiation alone.
100. Which of the following statements is CORRECT regarding hepatoblastoma ?
- (1) This is the most common primary cancer of the liver in adults.
 - (2) Hepatoblastoma is a chemoresistant tumor.
 - (3) Patients with this tumor have a poor outcome after liver transplantation, with a 5-year survival rate of 20%.
 - (4) The peak incidence of hepatoblastoma is within the first 2 years of life.
101. A 52-year-old man is admitted to the hospital due to new onset of symptomatic ascites and jaundice. He is an alcoholic and has no history of medical care prior to this encounter. He is mildly encephalopathic. Serum total bilirubin is 5.6 mg/dL and INR is 2.1. He is diagnosed with unresectable metastatic hepatocellular carcinoma and alcoholic cirrhosis after an extensive work up. The patient's family arrives and would like to discuss treatment options. Your recommendation will be ?
- (1) Gemcitabine and oxaliplatin.
 - (2) Sorafenib.
 - (3) Sunitinib.
 - (4) Hospice or supportive care alone
102. Which of the following is TRUE regarding GISTs ?
- (1) The most common mutation associated with GIST involves gain of function mutation in KIT proto-oncogene
 - (2) Both tumor size and mitotic index predict response to imatinib therapy.
 - (3) Gastric GISTs are associated with relatively worse outcomes compared with small intestinal GISTs.
 - (4) Patients with metastatic GIST tumors harbouring exon 9 mutations have a better prognosis and response to imatinib compared with those with exon 11 mutation.

103. A 60-year-old previously healthy woman noted abdominal distension and discomfort for 6 months, associated with nausea and vomiting. Computed tomography (CT) scan shows a 20 × 25-cm abdominal mass, and exploratory laparotomy demonstrated a pedunculated mass arising from the stomach. No other metastases were found. A partial gastrectomy was done, and pathology revealed a gastrointestinal stromal tumor (GIST) which strongly stains for CD117 and CD34. Sixty mitoses were seen per 50 high-power field (HPF). After she recovers from surgery, what would be your recommendation for further treatment ?
- (1) Observation with serial scans
 - (2) Imatinib 400 mg PO daily for 1 year
 - (3) Imatinib 400 mg PO daily for at least 3 years
 - (4) Sunitinib 50 mg 4 weeks on/2 weeks off therapy for 5 years
104. Familial and genetic syndromes associated with GIST is ?
- (1) Cowden syndrome
 - (2) Li-Fraumeni syndrome
 - (3) Lynch syndrome
 - (4) Neurofibromatosis
105. What is the most common type of small bowel malignancy ?
- (1) Adenocarcinoma
 - (2) Lymphoma
 - (3) Carcinoid
 - (4) Schwannoma

106. Which of the following are characteristic of primary intestinal mucosal-associated lymphoid tissue (MALT) lymphoma ?
- (1) Association with Hashimoto thyroiditis
 - (2) The majority of patients present with advanced stage disease
 - (3) Most common in women
 - (4) Associated with the translocation t(11;14)
107. Which gene is associated with hereditary nonpolyposis colorectal cancer (HNPCC) ?
- (1) APC
 - (2) MYH
 - (3) STK11
 - (4) MSH2
108. A 65-year-old woman presented with intermittent constipation and diarrhea associated with abdominal cramping. A colonoscopy revealed a near-obstructing mass and biopsy showed a villo-glandular polyp. She underwent an exploratory laparotomy and resection of a 5 × 5-cm circumferential necrotic and fungating mass. Pathology revealed a moderately differentiated adenocarcinoma invading into the pericolonic fat with 2 of 30 positive lymph nodes. Margins were negative. CT scan showed no evidence of metastatic disease. After recovery from her surgery, based on current evidence, what adjuvant treatment would you recommend ?
- (1) 5FU with leucovorin × 6 months
 - (2) Irinotecan with 5FU (FOLFIRI) × 6 months
 - (3) Oxaliplatin with 5FU (FOLFOX) × 6 months
 - (4) Oxaliplatin with 5FU (FOLFOX) and bevacizumab × 6 months

109. A 52-year-old teacher presents with a 2-month history of rectal bleeding. A rectal examination revealed a palpable non-obstructing mass 5 cm from the anal verge. Subsequent colonoscopy confirmed a friable, tethered mass biopsy that showed moderately differentiated adenocarcinoma. Transrectal ultrasound revealed a T3N1 cancer. CT scans of the chest, abdomen, and pelvis revealed no metastatic sites. Which of the following treatment strategies would you recommend ?
- (1) Total mesorectal excision (TME) alone
 - (2) TME followed by chemotherapy
 - (3) TME followed by chemoradiation
 - (4) Neoadjuvant 5FU-based chemoradiation followed by TME and adjuvant chemotherapy
110. Which genetic change is associated with resistance to treatment with cetuximab ?
- (1) KRAS mutation
 - (2) EGFR over expression
 - (3) KRAS wild type
 - (4) MLH1 inactivation
111. Which of the following associated with loss of VHL function is most likely to lead to tumor angiogenesis ?
- (1) Modulation of NF- κ B activity and downregulation of JUNB
 - (2) Increase in matrix metalloproteinases
 - (3) Increase in hypoxia inducible factor (HIF)
 - (4) Destabilization of microtubule formation
112. Inactivation or alteration in which of the following tumor suppressor genes is implicated in the pathogenesis of invasive bladder cancer ?
- (1) TP53
 - (2) RB1
 - (3) PTEN
 - (4) All of the above
113. A 76-year-old man with chronic obstructive pulmonary disorder and diabetes mellitus presents with back pain and confusion. Workup reveals extensive metastatic disease in the lungs, bones, and liver and a 6-cm tumor in the kidney. There is no evidence of cord compression. Laboratory studies reveal a calcium level of 11.5 mg/dL, lactate dehydrogenase (LDH) of 600, and a creatinine level of 2.0 mg/dL. Based on MSKCC risk factors, this patient would be considered:
- (1) No risk.
 - (2) Low risk.
 - (3) Intermediate risk.
 - (4) Poor risk.

114. Which of the following is the most common molecular abnormality seen in patients with prostate cancer ?

- (1) KRAS mutation
- (2) BRAF mutation
- (3) p53 mutation
- (4) Chromosomal translocations involving TMPRSS2

115. Which of the following is CORRECT about neoadjuvant chemotherapy (NACT) for urinary bladder transitional cell carcinoma ?

- (1) Three cycles of methotrexate, vinblastine, doxorubicin, and cisplatin before cystectomy are a standard of care.
- (2) Gemcitabine/carboplatin should be considered to decrease the risk of renal failure with cystectomy.
- (3) NACT increases the risk of surgical complications of cystectomy.
- (4) NACT should always be used with an organ preservation approach but is optional if cystectomy is chosen.

116. A 65-year-old man has been receiving combined androgen ablation with leuprolide and bicalutamide for 4 years for biochemical recurrence after radical prostatectomy. His PSA has increased from an undetectable nadir to 1.1 ng/mL on serial measurement over the period of 6 months. The PSA then continues to increase 2 months later to 2.5, with serum testosterone of 10 ng/mL. Bone scan and CT of the abdomen/pelvis do not reveal any metastatic disease, and he remains asymptomatic. The most appropriate therapy option is:

- (1) Continue current treatment regimen and active surveillance.
- (2) Docetaxel-based chemotherapy.
- (3) Start enzalutamide.
- (4) Discontinue bicalutamide

117. Which of the following statements about the androgen receptor is most CORRECT ?

- (1) The majority of its activity in prostate cancer is due to its cytoplasmic effects.
- (2) Up-regulation of androgen receptor expression has been linked to prostate cancer development.
- (3) Castration leads to complete inactivation of all androgen receptor-mediated pathways.
- (4) Castrate-resistant prostate cancer (CRPC) is associated with up-regulation of androgen receptor expression.



118. A 26-year-old man presents with cough and a left testicular mass. Work-up reveals multiple retroperitoneal lymph nodes and several lung nodules. Serum hCG is 80 mIU/mL, AFP is normal. Pathologic diagnosis of the testicular mass is pure seminoma. What is the best management decision?

- (1) Two cycles of BEP (bleomycin, etoposide, cisplatin)
- (2) Three cycles of BEP
- (3) Four cycles of BEP
- (4) Three cycles of EP

119. A 23-year-old male presents with painless enlargement of the testis and cough. Ultrasound reveals an intratesticular mass. CT scan of the chest, abdomen, and pelvis reveals multiple retroperitoneal nodes, liver metastases, and multiple pulmonary nodules, AFP is 16,000 ng/mL, beta-hCG is 200 mIU/mL. At the start of the third cycle of BEP, the patient is asymptomatic. AFP has decreased to 200, beta-hCG is undetectable. What is the next step in management?

- (1) Complete four cycles of BEP
- (2) Change treatment to salvage therapy with TIP
- (3) Repeat CT scans for assessment of disease response
- (4) Consider tandem high-dose therapy with stem cell rescue

120. A 32-year-old man previously treated for testicular cancer 3 years ago with four cycles of BEP now presents with pancytopenia. Evaluation reveals acute myelogenous leukemia (AML). What is the likely chromosome abnormality associated with this leukemia?

- (1) t(9:22)
- (2) 5q-
- (3) 13q deletion
- (4) 11q23 translocation

121. Which of the following feature is most characteristic of type I endometrial cancers?

- (1) Most of these cancers have serous or clear cell histology.
- (2) Risk factors include unopposed estrogen, anovulation, and obesity.
- (3) They are rarely (less than 5% of cases) associated with microsatellite instability.
- (4) The precursor lesion is preneoplastic atrophic endometrium

122. A 40-year-old woman is diagnosed with invasive cervical cancer. She has a 5-cm cervical tumor with parametrial involvement, and evidence of hydronephrosis on imaging. Her cancer is stage IIIB. You elect to treat her with combined chemotherapy and radiation. Which of the following applies to the treatment of locoregionally advanced cervical cancer?

- (1) Randomized trials involving patients with locally advanced cervical cancer have failed to demonstrate a benefit of chemotherapy in addition to standard radiation therapy.
- (2) Carboplatin appears to be the most appropriate agent to combine with radiation therapy for cervical cancer and this should be followed by hysterectomy.
- (3) Paclitaxel with cisplatin is an acceptable regimen to combine with radiation therapy and has demonstrated improved survival.
- (4) Weekly cisplatin with radiation therapy appears as active as other regimen with manageable toxicity.

123. After receiving definitive concurrent chemo-radiotherapy for stage IIIB cervical cancer, a patient develops a recurrence in the cervix, 18 months from the completion of therapy. Imaging studies suggest *no extrapelvic disease*. What would you recommend?

- (1) Referral back to the radiation oncologist for consideration of further radiation
- (2) Chemotherapy with combined cisplatin and topotecan
- (3) Chemotherapy with combined cisplatin and paclitaxel
- (4) Referral for consideration of radical surgery

124. A 55-year-old patient with a history of abnormal Pap smears presents for evaluation of a 3-cm vulvar mass. The mass is located 1 cm lateral to the clitoris on the right and has an ulcerated appearance. She states she noticed it 2 years ago and has tried many different ointments to help control the itching and irritation. This was recently biopsied to reveal invasive squamous cell carcinoma. What treatment would you recommend?

- (1) Neoadjuvant chemoradiation followed by local resection
- (2) Concurrent chemoradiation
- (3) Radical vulvectomy with bilateral inguinal lymphadenectomy
- (4) Local resection followed by radiation and/or chemotherapy

125. The most active (improved disease-free and overall survival) chemotherapy regimen as determined in randomized clinical trials in women with advanced or recurrent endometrial cancer with measurable disease is:

- (1) Doxorubicin plus paclitaxel
- (2) Cisplatin/doxorubicin
- (3) Cisplatin/doxorubicin/paclitaxel
- (4) Ifosfamide plus paclitaxel



126. A 35-year-old woman presents to you for recommendations regarding therapy of her newly diagnosed mucinous ovarian cancer. This was a 5-cm, grade 1, left-sided mass that was incidentally found at the time of surgery for endometriosis as part of an infertility workup. The ovary was removed, and the operative note states that there was no evidence of tumor on the external surface of the ovary or elsewhere in the abdomen, but full surgical staging was not performed. A postoperative computed tomography (CT) scan of the abdomen and the pelvis is unremarkable, and CA-125 is within normal limits. Pelvic examination is unremarkable. The patient would like to have children but does not want to compromise her survival. What should be your advice to the patient?

- (1) She is unlikely to have any residual cancer or a recurrence, and further surgery or chemotherapy is not needed.
- (2) Because her CT scan and CA-125 are normal, she is unlikely to have any residual disease, and further surgery is not needed. However, because the mucinous subtype of ovarian cancer has a very poor prognosis, she will require three to six cycles of carboplatin/paclitaxel chemotherapy.
- (3) She should have complete surgical staging, if possible, via laparoscopy, with the option of preserving her uterus and contralateral ovary if there is no further evidence of tumor, which is associated with a >90% chance of 5-year survival and does not require chemotherapy.
- (4) She should have complete surgical staging, including TAH/BSO. If no further disease is found, she will need only three cycles of carboplatin/paclitaxel chemotherapy, but if there is disease outside the ovary, she will need six cycles

127. Which of the following increases the risk of a woman developing ovarian cancer?

- (1) Use of oral contraceptives for >5 consecutive years
- (2) Nulliparity
- (3) Breastfeeding
- (4) Tubal ligation

128. A 50-year-old woman presents with a pelvic mass. She is found to have a tumor of low malignant potential. With TAH/BSO and staging, there is no gross disease but the washings were positive on final pathology and there was one positive lymph node, making her disease stage IIIC. What is the most appropriate therapy postoperatively?

- (1) Intraperitoneal cisplatin and intravenous (IV) taxane
- (2) IV platinum and a taxane
- (3) Hormonal therapy with tamoxifen or an aromatase inhibitor
- (4) No further therapy

129. A 51-year-old woman presents to you for recommendations regarding the treatment of her recurrent ovarian cancer. She was optimally debulked for stage IIIC serous ovarian carcinoma and completed six cycles of carboplatin/paclitaxel 36 months ago with a clinical complete remission. She now has recurrent ascites, which is histologically positive for tumor compatible with her original primary. CT scan shows peritoneal carcinomatosis and a pelvic mass. What should your advice to her be ?

- (1) Prognosis of recurrent ovarian cancer is poor. She may achieve short-term benefit from chemotherapy although hospice is a reasonable option.
- (2) Tamoxifen has a 40% chance of response.
- (3) She has a very high likelihood of disease shrinkage and symptom palliation with further platinum-based chemotherapy.
- (4) She has a chance of cure with autologous stem cell transplant.

130. A 45-year-old woman has undergone surgical resection followed by adjuvant chemotherapy for her stage IIIC ovarian cancer. She is now in complete remission and is interested in further treatment to reduce the risk of recurrent disease. Which of the following would you recommend ?

- (1) Maintenance treatment with single-agent paclitaxel for 12 months
- (2) Ask for BRCA 1 & 2 mutation and if positive advise PARP inhibitor
- (3) Maintenance treatment with single-agent topotecan
- (4) Maintenance treatment with bevacizumab

131. What percentage of breast cancers is caused by germline mutations ?

- (1) 20%
- (2) 10%
- (3) 15%
- (4) 2%

132. Li-Fraumeni syndrome is characterized by which clinical features ?

- (1) Lobular breast cancer, gastric cancer
- (2) Breast cancer, soft tissue sarcoma, central nervous system tumors, adrenocortical cancer, leukemia, prostate cancer
- (3) Breast cancer, hamartoma, thyroid cancer, oral mucosa cancer, endometrial cancer, brain tumors
- (4) Male breast cancer, pancreas cancer, gall bladder cancer, pharynx cancer, gastric cancer, melanoma, prostate cancer

133. Which of the following statements about Luminal A subtype of breast cancer is TRUE ?

- (1) It is more common in premenopausal women
- (2) Luminal A breast cancers frequently carry TP53 mutations
- (3) It is characterized by high-expression levels of ER-related genes and low expression of the HER2 cluster and proliferation-associated genes.
- (4) It has a worse prognosis than other molecular subtypes of breast cancer.



134. Which of the following scenarios are considered a contraindication to the use of tamoxifen ?

- (1) Major surgical procedure within the previous 6 months
- (2) A history of deep vein thrombosis, stroke, pulmonary embolism, or transient ischemic attack
- (3) A 60-year-old woman with bilateral asymptomatic cataracts
- (4) A 65-year-old woman currently on an SSRI for hot flashes

135. Which of the following statement about DCIS is TRUE ?

- (1) DCIS accounts for 15% to 30% of mammographically detected cancers.
- (2) DCIS is most common in women aged 40 to 59 years.
- (3) Younger women have a lower rate of local recurrence after local therapy
- (4) Sentinel lymph node biopsy should be performed routinely during breast-conservation surgery for non-palpable DCIS.

136. Identify the CORRECT statement.

- (1) Patients age 70 and above with stage 1, ER+ breast cancer treated by lumpectomy and tamoxifen alone have no difference in locoregional recurrence rates relative to those who receive whole breast radiation in addition.
- (2) Preoperative chemotherapy has a long-term survival advantage relative to adjuvant chemotherapy.
- (3) Concurrent use of pertuzumab with trastuzumab and chemotherapy is appropriate in women receiving preoperative chemotherapy for HER2+ breast cancer.
- (4) All of the above.

137. Identify the CORRECT statement.

- (1) A maximum duration of 5 years is the only duration for which safety and efficacy data exists for an aromatase inhibitor.
- (2) Ovarian suppression in combination with tamoxifen has no benefit relative to tamoxifen alone in high-risk premenopausal women with breast cancer.
- (3) Concurrent use of an aromatase inhibitor and tamoxifen is appropriate therapy for high-risk node-positive breast cancer patients.
- (4) All patients treated with aromatase inhibitors should undergo monitoring of bone mineral density and treatment with denosumab when osteoporosis is detected.

138. Identify the CORRECT statement regarding the use of taxanes in the adjuvant setting:

- (1) Concurrent administration of docetaxel/doxorubicin/cyclophosphamide chemotherapy is better tolerated than sequential dose-dense AC followed by paclitaxel due to lower rates of neutropenia.
- (2) Weekly paclitaxel is associated with increased grade 3 and 4 neutropenia relative to dose-dense paclitaxel.
- (3) Weekly paclitaxel is associated with increased grade 3 and 4 neuropathy relative to dose-dense paclitaxel.
- (4) Incorporation of gemcitabine into adjuvant anthracyclines- and taxanes-based chemotherapy improves efficacy.

139. With regard to the clinical and pathologic characteristics of male breast cancer, which of the following is TRUE ?

- (1) Male breast cancer is found, more often than female breast cancer, to be estrogen receptor negative, and the older a man is with breast cancer, the more likely the cancer is estrogen-receptor negative.
- (2) Liver cirrhosis and mumps orchitis are associated with a decreased risk of male breast cancer
- (3) The median age of onset is 10 years younger than the median age of onset for females.
- (4) Sentinel node biopsy is the preferred treatment for clinically node-negative patients.

140. Regarding breast cancer and bone metastases, which of the following is TRUE ?

- (1) The optimal duration of RANK-ligand inhibition is 2 years.
- (2) Intravenous bisphosphonates and RANK-ligand inhibitors lessen the pain associated with bone metastases.
- (3) Bone directed therapies in patients with widespread bone metastases improve overall survival.
- (4) Only patients with asymptomatic sclerotic bone metastases benefit from bone-directed therapies.

141. Primary (de novo) glioblastoma multiforme (GBM) is commonly associated with which of the following ?

- (1) PTEN inactivation
- (2) Loss of heterozygosity of chromosomes 1p and 19q
- (3) IDH1 mutation
- (4) Median age <40 years

142. Which gene mutation identified in GBM is frequently seen in younger patients, and is associated with better prognosis:

- (1) EGFR.
- (2) p53.
- (3) IDH1.
- (4) Gain in chromosome 4.

143. Patients with GBM have a higher likelihood of responding to therapy with epidermal growth factor receptor tyrosine kinase (EGFR-TK) inhibitors if which of the following biomarkers is present ?

- (1) Methyl guanine methyl transferase (MGMT) gene methylation
- (2) Activated EGFRvIII
- (3) Retained PTEN function
- (4) (2) and (3)

144. The primary CNS neoplasm that is associated with Epstein-Barr virus (EBV) is:

- (1) Primary CNS lymphoma.
- (2) Ependymoma.
- (3) Oligodendroglioma.
- (4) GBM.



145. A 45-year-old man presents with generalized seizures, and MRI of the brain reveals a non-enhancing mass measuring 7 cm. Biopsy is done, and the tumor histology is reported as grade II astrocytoma. The patient undergoes surgery, and a partial (85% to 90%) tumor resection is achieved. Further treatment should include:
- (1) Watchful waiting.
 - (2) Chemotherapy with temozolamide and bevacizumab
 - (3) Radiotherapy with 50.4 Gy in 1.8 Gy fractions.
 - (4) Radiotherapy with chemotherapy (procarbazine, CCNU, and vincristine).
146. Which of the following are TRUE about radiation-induced sarcomas ?
- (1) Cancer history usually includes breast cancer, lymphoma, and cervical cancer.
 - (2) They usually occur 10 to 30 years after radiation exposure.
 - (3) Osteogenic sarcoma, undifferentiated pleomorphic sarcoma (UPS), angiosarcoma, and lymphangiosarcoma are the usual histologic subtypes.
 - (4) All of the Above.
147. Which clonal cytogenetic abnormality is associated with the CORRECT sarcoma subtype ?
- (1) Ewing sarcoma and t(11;22) (q24;q12)
 - (2) Synovial sarcoma and t(12;16) (q13;p11)
 - (3) Myxoid liposarcoma and t(X;18) (p11;q11)
 - (4) Alveolar rhabdomyosarcoma and t(17;22) (q22;q13)
148. A 52-year-old man underwent resection of a 3-cm mass from the lateral left thigh. Pathology revealed a high-grade leiomyosarcoma, and the lateral surgical margin was positive. The most appropriate next step in the treatment of this patient's cancer would be:
- (1) Radiation.
 - (2) Adjuvant chemotherapy.
 - (3) Re-resection.
 - (4) Observation.
149. A 68-year-old woman presented with a purplish nodular lesion in the occipital scalp. Resection revealed an angiosarcoma measuring 3 cm. Surgical margins were negative. What is the most appropriate next step in the treatment of this patient's cancer ?
- (1) Radiologic imaging to look for nodal metastases and referral for adjuvant radiation
 - (2) Monitoring
 - (3) Adjuvant chemotherapy with an anthracycline
 - (4) Adjuvant chemotherapy with paclitaxel
150. A 65-year-old woman presented with abdominal pain and iron-deficiency anemia. Workup revealed a gastric mass and multiple large intra-abdominal masses and liver hypodensities. Biopsy of the gastric mass revealed a spindle cell neoplasm thought to be a leiomyosarcoma. After three cycles of doxorubicin and ifosfamide, imaging showed disease progression. The appropriate next step in the management of this patient's cancer would be:
- (1) Docetaxel and gemcitabine.
 - (2) Dacarbazine.
 - (3) Request the pathologist to perform a CD117 (c-Kit) stain.
 - (4) Palliative radiation.

151. What is the most prevalent significantly mutated gene in cutaneous melanoma ?

- (1) BRAF V600K
- (2) BRAF V600R
- (3) BRAF V600E
- (4) NRAS Q61R

152. A 40-year-old woman with a history of ulcerative colitis, mitral valve prolapse, eczema, and stage 1 cutaneous melanoma presents with right inguinal adenopathy. Physical examination confirms a 4-cm node and core biopsy confirms malignant melanoma. BRAF mutational analysis is requested and BRAF V600E mutation is detected. Brain MRI is unremarkable; however, CT examination reveals numerous (>10) bilateral pulmonary metastases with the largest lesion measuring 1.2 cm in the left upper lobe. No other sites of distant metastases are evident and you conclude that this patient has stage IV, M1b disease. What is the best initial treatment for this individual ?

- (1) Ipilimumab
- (2) BRAF inhibitor
- (3) MEK inhibitor
- (4) BRAF and MEK inhibitor combination

153. An 8-year-old child is brought to clinic by his mother due to a jaw lump that has been increasing in size over the past month. Physical examination reveals a child in moderate distress with a left jaw mass that displaces teeth and is impinging on the trachea. Biopsy reveals sheets of atypical lymphocytes with areas of necrosis and hemorrhage. Ki-67 is 99%. Flow cytometry shows B-cell markers as well as CD10 and BCL-6. CD5, BCL-2, and TdT are absent. Which of the following is the most common translocation in this malignancy ?

- (1) t(1;14)
- (2) t(2;8)
- (3) t(8;14)
- (4) t(8;22)

154. A 69-year-old man presents to his primary care doctor for persistent nausea associated with non-bloody, non-bilious emesis, loss of appetite, and 30-lb weight loss over approximately 1 year. He also recalls having occasional dark stools. Physical examination reveals splenomegaly. PET/CT reveals FDG avidity of intra-abdominal lymph nodes as well as uptake in the stomach and small and large bowel. Upper and lower endoscopy reveals a non-bleeding gastric ulcer and diffuse polyps in the colon. Biopsies are performed. Cells express surface IgM and IgD along with CD5, CD19, and CD20. Cytogenetics reveals t(11;14). Which of the following statement is INCORRECT regarding the next step in management ?

- (1) Consolidation with autologous stem cell transplantation in first remission is an approach often considered for fit patients.
- (2) Treatment with ibrutinib in the upfront setting is limited because of its association with peripheral neuropathy.
- (3) Front-line therapy for elderly patients with good performance status includes bendamustine and rituximab.
- (4) Hyper-CVAD with rituximab may be administered to patients with more aggressive disease.



155. 63-year-old woman with a past medical history of HIV presents to the emergency room with shortness of breath. She notes that it has been worsening over the past 3 to 4 months, but became unbearable over the past week. Review of systems is positive for involuntary weight loss of 30 lb over 4 months and pedal edema. Physical examination reveals pitting edema to the knees bilaterally. PET/CT scan shows diffuse adenopathy of the mediastinum and the pelvis, with the largest nodes measuring 2.5 cm. No extra-nodal disease is appreciated. Excisional biopsy reveals proliferating large and small lymphocytes. Ki-67 is 85%. Flow cytometry reveals cells that are CD19, CD20, and CD22 positive and negative for CD10 and BCL-6. Which of the following statements regarding management is accurate ?

- (1) R-CHOP chemotherapy is appropriate.
- (2) ABVD chemotherapy is preferred as first-line management.
- (3) Allogeneic stem cell transplant is the treatment of choice if the patient were to relapse with chemosensitive disease.
- (4) Rituximab with CHOP confers greater benefits in patients who lack BCL-6 expression, based on the GELA R-CHOP trial.

156. A 43-year-old woman presents to a dermatologist with a diffuse skin rash, described as red and itchy with associated thickening of the palms and soles that has been slowly progressing for the past 4 years. Physical examination reveals erythematous plaques on 20% of the body surface area. FDG PET reveals absence of extra-cutaneous disease. Skin biopsy reveals Pautrier microabscesses. Immunophenotyping reveals expression of CD2, CD3, CD5, and CD7. What is the next best step in management ?

- (1) EPOCH chemotherapy combined with pentostatin and fludarabine with interferon alpha
- (2) Extracorporeal photochemotherapy
- (3) Locally applied denileukin diftitox with or without vorinostat
- (4) Topical carmustine or mechlorethamine, bexarotene, or ultraviolet B with or without interferon alpha

157. Which of the following accurately describes an aspect of primary CNS lymphoma (PCNSL) ?

- (1) AIDS patients tend to have large, invasive unifocal masses that rapidly progress without HAART therapy.
- (2) Incidence has decreased fivefold from 1985 to 1997 due to advances in treatment of immune-suppressed patients.
- (3) Many masses are periventricular, allowing tumor cells access to cerebrospinal fluid.
- (4) Presents most commonly in the occipital lobe, manifesting as vision changes and gait abnormalities.

158. Which of the following statements best characterizes nodular lymphocyte-predominant Hodgkin lymphoma (NLPHL) in contrast to classic Hodgkin lymphoma (cHL) ?

- (1) Approximately 80% of patients with NLPHL have stage I to II disease at the time of diagnosis.
- (2) Bone marrow involvement is frequent with stage III to IV disease.
- (3) Disease presentation manifests predominantly in thoracic nodes before spreading to the mediastinum.
- (4) NLPHL cells express CD30 and CD45 as well as B-cell antigens

159. A 24-year-old GIPO woman presents to her physician with fever, neck pain, fatigue, and 10-lb weight loss during the first trimester of pregnancy. She is concerned about the health of her fetus. Physical examination reveals non-tender cervical adenopathy, leading to a biopsy, which reveals cells that are positive for CD15 and CD30 and negative for CD3, CD7, CD20, and CD45. Morphology is pertinent for Reed-Sternberg cells in a background of inflammatory cells. Which of the following accurately describe(s) an aspect of care for such patients ?

- (1) BEACOPP chemotherapy is preferred to ABVD for treatment during the first trimester due to the lack of anti-metabolites in the regimen.
- (2) MRI scanning is preferred for staging because it is non-teratogenic.
- (3) Long-term survival of treated pregnant women is inferior to that of non-pregnant women with the disease.
- (4) Radiation therapy with abdominal shielding can be safely used for bulky disease above the diaphragm.



160. You are caring for a 25-year-old woman with AML-M2 and normal cytogenetics. She receives 7+3 induction therapy, and her day-14 bone marrow biopsy is ablated. She returns to clinic and her day-45 bone marrow shows normal hematopoiesis. However, she relapses after 18 months. Which of the following likely contributed to her relapse ?
- (1) DNMT3A mutation
 - (2) CEBPA mutation
 - (3) NPM mutation without FLT3-ITD
 - (4) Her age
161. Which of the following is a poor prognostic factor in adult ALL ?
- (1) Age <55 years
 - (2) WBC <10,000
 - (3) Diploid chromosomes on karyotyping
 - (4) t(4;11)
162. A 30-year-old, otherwise healthy woman is diagnosed with AML. Cytogenetics reveal inv(16). She undergoes induction therapy. Day-14 bone marrow biopsy shows an ablated marrow. Her day-45 marrow shows restored cellularity without evidence of disease. Repeat cytogenetics do not reveal the inv(16) rearrangement. What would be most appropriate consolidation therapy for this patient ?
- (1) Allogeneic transplant if a matched sibling donor is available.
 - (2) High-dose cytarabine (HIDAC) 3 g/m² every 12 hours on days 1, 3, and 5 for four 28-day cycles.
 - (3) Intermediate-dose cytarabine (IDAC) 300 mg/m² every 12 hours on days 1, 3, and 5 for four 28-day cycles.
 - (4) Arsenic 0.15 mg/kg on days 1 to 5 for four 28-day cycles.
163. Which of the following targeted agents have been shown to be beneficial in adult ALL ?
- (1) Imatinib
 - (2) Alemtuzumab
 - (3) Gemtuzumab ozogamicin
 - (4) Sunitinib
164. For which of the following patients would you consider myeloablative stem cell transplantation in CR1 ?
- (1) A 30-year-old woman with inv(16) AML-M4 with eosinophilia
 - (2) A 50-year-old man with complex cytogenetics AML-M1
 - (3) A 65-year-old man with complex cytogenetics AML-M1
 - (4) A 50-year-old woman with t(15;17) AML-M3
165. A 69-year-old male with a history of COPD, coronary artery disease and diabetes mellitus was diagnosed with chronic-phase chronic myeloid leukemia (CML). What is the most appropriate therapeutic intervention ?
- (1) Imatinib 400 mg QD
 - (2) Dasatinib 100 mg QD
 - (3) Nilotinib 300 mg BID
 - (4) Ponatinib 30 mg QD

166. A 60-year-old female has been under your care for chronic-phase CML for the past 2 years. She achieved complete response on nilotinib. She subsequently developed thrombocytopenia with elevated RQ-PCR and a bone marrow biopsy showed 42% Ph-positive metaphases. Mutational analysis showed T315I mutation in the ABL domain. What is the appropriate treatment for this patient?

- (1) Imatinib
- (2) Ponatinib
- (3) Dasatinib
- (4) Bosutinib

167. With the advent of tyrosine kinase inhibitors (TKIs), allogeneic stem cell transplantation (allo-HCT), once a primary therapy for CML, is now reserved for specific CML patients.

What are the indications for allo-HCT in CML?

- (1) Progression to CML accelerated/blast phase
- (2) Resistance to first-line TKIs but continues to be in chronic phase
- (3) Availability of a matched sibling donor
- (4) Young patients (<50 years of age)

168. Minimal residual disease assessment is NOT the standard-of-care for which haematological malignancy as of date?

- (1) Acute Lymphoblastic leukemia
- (2) Chronic Myeloid leukemia
- (3) Multiple Myeloma
- (4) Acute Myeloid leukemia

169. A 56-year-old man was recently diagnosed with Rai stage 0 CLL. He is professor of chemical engineering in one of the IITs, has read about newer therapies and wanted to know when he can start treatment. Which of the following findings would be an indication for initiation of systemic therapy?

- (1) Availability of newer treatment modalities such as ibrutinib, idelalisib, and CAR-T cells
- (2) An increase in his absolute lymphocyte count from $25 \times 10^9/L$ to $40 \times 10^9/L$ over the last 2 years
- (3) Recent diagnosis of hypogammaglobulinemia
- (4) Fever of $38^\circ C$ for the last 2 weeks without evidence of infection

170. A 61-year-old female with a history of CLL and 17p deletion was treated with six cycles of FCR and subsequently achieved complete remission. One year later, she started noticing increased diffuse lymph node swelling and progressive unintentional weight loss. Initial workup demonstrated WBC count of 1.2×10^5 cu mL and a platelet count of 65,000 cumL. A repeat lymph node biopsy showed CLL. What is the next best treatment?

- (1) Ibrutinib 420 mg PO Q daily
- (2) Ibrutinib 840 mg PO Q daily
- (3) Ofatumumab
- (4) Fludarabine + cyclophosphamide + rituximab



171. A 25-year-old female, bank employee, presented with severe upper back pain and dry cough. No significant prior history, 4 kg weight loss, No night sweats.
Physical examination: WHO Performance status 2, Right pleural effusion, right supra clavicular and right axillary LN palpable
Laboratory results: normal blood count, increased lactate dehydrogenase. XRC-Mediastinal mass Lymph node excision biopsy, anaplastic large cell lymphoma (ALCL), CD30+ Which is the most important prognostic IHC biomarker in ALCL ?
(1) Expression of MYC
(2) Expression of ALK
(3) Expression of TP53
(4) Expression of BCL2
172. A 28-year-old man was found to have stage IV Burkitt's lymphoma. His renal function was normal and a staging CT scan had shown no abnormality of the renal tract. Three days later, when he was about to start chemotherapy, he developed a temperature of 39.0°C with rigors and was treated with imipenem. Investigations (the following day):
- serum sodium 138 mmol/L (137-144)
 - serum potassium 6.2 mmol/L (3.5-4.9)
 - serum creatinine 215 µmol/L (60-110) / 2.43 mg/dL (0.6-1.2)
 - serum corrected calcium 1.60 mmol/L (2.20-2.60) / 6.4 mg/dL (8.5 - 10.2)
 - serum phosphate 1.52 mmol/L (0.8-1.4) / 4.71 mg/dL (3.0 - 4.5)
 - serum lactate dehydrogenase 1238 U/L (10-250)
 - serum urate 0.69 mmol/L (0.19-0.36) / 11.6 mg/dL (2.4 - 6.0)
- What is the most likely cause of the renal impairment ?
(1) imipenem toxicity
(2) intravenous contrast, toxicity
(3) septic shock
(4) tumour lysis syndrome
173. A 40-year-old woman presented with post-coital bleeding. Investigations revealed a 2-cm grade 1, stage IB1 squamous cell carcinoma of the cervix. There was no evidence of lymphovascular space invasion. She had completed her family. What is the most appropriate treatment ?
(1) brachytherapy
(2) chemo-radiotherapy
(3) excision cone biopsy only
(4) radical hysterectomy
174. A 52-year-old man, heavy tobacco chewer, presented with vomiting and 4-kg weight loss. His performance status was 1. He was found to have a pre-pyloric gastric carcinoma with gastric outlet obstruction. A CT scan showed no metastases. What is the most appropriate next step ?
(1) chemo-radiation
(2) neoadjuvant chemotherapy
(3) palliative bypass
(4) radical resection
175. A 62-year-old man, presented with recent change in bowel habits and intermittent rectal bleeding, was found to have an anterior rectal cancer at 2 cm from the anal verge. A CT scan of chest, abdomen and pelvis showed no evidence of metastatic disease. An MR scan of pelvis showed an anterior tumour abutting the prostate gland, radiologically staged as a T3, N1, M0 cancer. What is the most appropriate next step in management ?
(1) abdominoperineal resection
(2) chemotherapy
(3) long-course chemoradiation
(4) short-course radiotherapy

176. A 48-year-old man presented with a 1-month history of altered personality, incontinence and seizures. An MR scan of brain demonstrated an enhancing lesion in the right frontal lobe. Histology revealed a grade 3 oligodendroglioma, with loss of heterozygosity of 1p/19q. What is the most appropriate treatment ?

- (1) chemoradiation with temozolomide
- (2) cranial irradiation
- (3) procarbazine, vincristine and lomustine (PCV)
- (4) temozolomide

177. A 45-year-old woman with early breast cancer, T2N1MO, triple negative, presented with fever and fatigue to the accident and emergency department on day 7 of her first adjuvant chemotherapy cycle with the TAC (docetaxel, doxorubicin, cyclophosphamide) regimen. On examination, her temperature was 38.5°C, her pulse was 110 beats per minute and her blood pressure was 110/70 mmHg. A full blood count was requested. What is the most appropriate next step ?

- (1) await full blood count result
- (2) intravenous broad-spectrum antibiotics
- (3) intravenous broad-spectrum antibiotics and granulocyte colony-stimulating factor
- (4) oral broad-spectrum antibiotics and G-CSF

178. A 35-year-old man sought advice about the increased risk of cardiac complications following chemotherapy. Eight years previously, he had been successfully treated for Hodgkin's disease with six cycles of doxorubicin, bleomycin, vinblastine and dacarbazine, and mediastinal radiotherapy. For how many years from the end of treatment will this increased risk persist ?

- (1) 6-10
- (2) 11-15
- (3) 16-20
- (4) >20

179. A 55-year-old woman presented with hot flushes. Her last menstrual period had been 1 year previously. She was treated with ethinylestradiol and medroxyprogesterone acetate. Which potential consequence of oestrogen therapy is most reduced by co-prescription of a progestogen ?

- (1) breast cancer
- (2) breast pain
- (3) endometrial cancer
- (4) mood changes

180. A 59-year-old man was referred because of a change in bowel habit. He had noticed no alteration in stool calibre, gastrointestinal bleeding or unintended weight loss. There was no family history of colonic polyps or gastrointestinal malignancy.

Physical examination was normal. A rectal examination revealed no masses. A sigmoidoscopy revealed a 4-mm polyp in the mid-rectum, which was removed with forceps, and histology revealed a tubular adenoma. What is the most appropriate next step in management ?

- (1) barium enema now
- (2) colonoscopy in 3 years
- (3) colonoscopy in 5 years
- (4) colonoscopy now



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