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Imaging Breast Cancer in At-Risk Populations

Part 1

1. Males account for ____% of breast cancer cases.
 - a. 1
 - b. 5
 - c. 10
 - d. 18

2. The approximate chances of a woman 50 to 60 years old developing invasive breast cancer is 1 out of:
 - a. 257
 - b. 67
 - c. 36
 - d. 24

Part 2

3. Inheritance of a genetic condition that occurs when a mutation is present in one copy of a gene is referred to as:
 - a. a single nucleotide
 - b. linkage transference
 - c. autosomal recessive
 - d. autosomal dominant

4. A nucleotide is a molecule consisting of a/an ____ containing base.
 - a. nitrogen
 - b. hydrogen
 - c. oxygen
 - d. sulfide

5. A polymorphism refers to a common mutation typically defined as an allele frequency of **at least** ____%.
 - a. 22
 - b. 16
 - c. 9
 - d. 1

6. First-degree relatives are:
- parents
 - siblings
 - children of the person
 - all of the above
7. The single greatest risk factor for ovarian cancer is:
- increasing age
 - family history of ovarian cancer
 - consistent use of hormone replacement therapy (HRT)
 - multiple pregnancies at a late age
8. When a parent carries an autosomal dominant genetic predisposition, each child has a ___ chance of inheriting the predisposition.
- 10:10
 - 25:25
 - 50:50
 - 75:75
9. Germline refers to cells from which ___ are derived.
- nerves
 - muscles
 - bones
 - eggs or sperm
10. The *BRCA1* gene is located on chromosome:
- 7
 - 9
 - 13
 - 17
11. The *BRAC2* gene is located on chromosome:
- 7
 - 9
 - 13
 - 17
12. Li-Fraumeni syndrome is due to mutations in the ___ gene:
- BRCA1
 - BRCA2
 - PTEN
 - TP53

13. It is estimated that ___% of the general population may be heterozygote carriers of ataxia telangiectasia (AT) mutations.
- a. 1
 - b. 3
 - c. 5
 - d. 7
14. Peutz-Jeghers syndrome is related to mutations in the ___ gene at chromosome 19p 13.3.
- a. BRCA1
 - b. BRCA2
 - c. PTEN
 - d. STK11
15. Breast cancer occurring in *BRCA1* mutation carriers is **more** likely to be **all** of the following, **except**:
- a. estrogen-receptor negative
 - b. progesterone receptor negative
 - c. borderline histopathology
 - d. HER2/neu receptor-negative
16. When comparing self-reported information with independently verified cases, the sensitivity of a history of ovarian cancer is ___%.
- a. 20
 - b. 30
 - c. 60
 - d. 90
17. A test with high sensitivity has a ___ false-negative rate.
- a. high
 - b. low
 - c. moderate
 - d. minus zero
18. Sporadic cancer refers to cancer developing in people who carry a high-risk mutation.
- a. True
 - b. False
19. Cumulative risk of breast cancer increases with **all** of the following, **except**:
- a. increasing age
 - b. early menarche
 - c. late menopause
 - d. early first full-term pregnancy

20. Since *BRCA1/2* mutation carriers are heterozygotes, radiation sensitivity may occur only after:
- one or more full-term pregnancies
 - a genetic mutation has damaged the normal copy of the gene
 - a somatic mutation has damaged the normal copy of the gene
 - the radiation exposure follows aggressive chemotherapy
21. The risk of breast cancer increases by approximately 10% for each ___ g of daily alcohol intake.
- 10
 - 6
 - 2
 - 0.5
22. Before age ___ years, the risk of developing epithelial ovarian cancer is remote, even in hereditary cancer families.
- 55
 - 40
 - 35
 - 30
23. Factors associated with an **increase** in risk for ovarian cancer include **all** of the following, **except**:
- increasing age
 - nulliparity
 - bilateral tubal ligation
 - menopausal use of hormone replacement therapy
24. Ovarian cancer risk is reduced > ___% in women with documented *BRCA1* or *BRCA2* mutations who chose risk-reducing salpingo-oophorectomy (RRSO).
- 90
 - 75
 - 50
 - 25
25. Generally, the Claus or Gail models should **not** be used for women who have both breast and ovarian cancer.
- True
 - False
26. Ashkenazi Jews are Jewish individuals from one of the major ancestral groups whose ancestors lived in:
- Germany
 - Poland
 - Russia
 - All of the above

27. The Gail model has been found to be reasonably accurate in **all** of the following, **except**:
- a. large groups of white women
 - b. women compliant with breast screening
 - c. women from same age-risk strata
 - d. individual patients

Part 3

28. After gender and age, the strongest known predictive risk factor for breast cancer is:
- a. radiation exposure
 - b. obesity
 - c. long term hormone replacement therapy (HRT)
 - d. positive family history
29. Mutation carriers who have a risk of developing breast cancer that may exceed 50% comprise **no more than** ___% to ___% of all breast cancers.
- a. 1 – 2
 - b. 5 – 10
 - c. 25 – 30
 - d. 45 – 50
30. Hereditary breast cancer is characterized by early age at onset, on average 5 to ___ years earlier than in sporadic cases.
- a. 6
 - b. 10
 - c. 15
 - d. 20
31. In families with both breast and ovarian cancer, the *BRCA1* gene appears to be responsible for up to ___% of the cases.
- a. 90
 - b. 70
 - c. 50
 - d. 30
32. Male breast cancer, pancreatic cancer, and prostate cancer are more strongly associated with mutations in:
- a. *BRCA1*
 - b. *BRCA2*
 - c. TP53
 - d. PTEN

33. Mutations in the *BRCA2* gene are thought to account for approximately ___% of breast cancer in families with multiple individuals affected by the disease.
- 15
 - 35
 - 55
 - 75
34. The *BRCA2* gene is a large gene with ___ exons that encode a protein of 3,418 amino acids.
- 6
 - 12
 - 27
 - 42
35. A variety of evidence now points to *BRCA1* and *BRCA2* being directly involved in the DNA repair process.
- True
 - False
36. Nearly ___ distinct mutations and sequence variations in the *BRCA1* and *BRCA2* gene have already been described.
- 300
 - 500
 - 1000
 - 2000
37. A higher rate of variant of uncertain significance (VUS) appears in:
- Chinese
 - Norwegians
 - Asians
 - African Americans
38. The transmission, together, of 2 or more genes on the same chromosome, as a result of their being in very close physical proximity to one another is referred to as:
- cosegregation
 - collaboration
 - penetrance
 - confounding
39. Approximately 1 in ___ individuals in the general population may carry a pathogenic mutation in the *BRCA1* gene.
- 1000
 - 800
 - 400
 - 150

40. The ___ effect occurs when a gene mutation is observed in high frequency in a specific population due to the presence of that gene mutation in a single ancestor or a small number of ancestors.
- linkage
 - recessive
 - Mendelian
 - founder
41. The proportion of individuals carrying a mutation that will manifest the disease is referred to as the:
- proband
 - allele
 - congregate
 - penetrance
42. The individual through whom a family with a genetic disorder is ascertained is referred to as:
- proband
 - allele
 - congregate
 - penetrance
43. Among Ashkenazi Jewish men with breast cancer (regardless of age), the likelihood of having 1 of 3 founder mutations is 1 in:
- 5
 - 10
 - 15
 - 25
44. The **only** model for estimating the likelihood of a *BRCA* mutation to incorporate unaffected relatives, male breast cancer, bilateral breast cancer, and age at diagnosis for all affected individuals is the:
- Couch
 - Shattuck-Eidens
 - Frank
 - Parmigiani
45. Genetic testing for *BRCA1* and *BRCA2* has been available to the public since:
- 1978
 - 1985
 - 1996
 - 2001

46. A/An ____ is a physical site or location of a specific gene on a chromosome.
- contraband
 - exon
 - locus
 - missense
47. Repetitive segments of DNA scattered throughout the genome in noncoding regions between gene or within genes is called a:
- microsatellite
 - germline
 - missense
 - locus
48. The frequency with which a test result yields a negative result when the individual being tested is actually unaffected and/or does **not** have the gene mutation in question is referred to as:
- reliability
 - representative
 - specificity
 - sensitivity
49. In regard to prognosis, a Norwegian and related studies reported that breast cancer occurring in *BRCA1* mutation carriers were more likely to have **all** of the following characteristics, **except**:
- invasive
 - high grade
 - low mitotic rates
 - estrogen receptor negative
50. The *BRCA2* founder mutation (999del5) gene accounts for nearly all hereditary breast cancer in:
- Ireland
 - Iceland
 - Sweden
 - Russia
51. Ovarian cancer arising in women with *BRCA1* and *BRCA2* gene mutations is more likely to be invasive:
- dysgerminoma
 - granulosa cell
 - Sertoli Leydig
 - serous adenocarcinoma

52. Li-Fraumeni syndrome is characterized by:
- premenopausal breast cancer
 - childhood sarcoma
 - childhood brain tumors and leukemia
 - all of the above
53. In a study of 3,228 women diagnosed with breast cancer before age 51, three founder alleles in *CHEK2* contributed to 8% of early onset breast cancer in:
- Russia
 - Poland
 - China
 - Turkey
54. **All** of the following are characteristics of Cowden syndrome, **except**:
- skin manifestations including multiple trichilemmomas, oral fibromas and papillomas
 - thyroid disease both benign and malignant
 - is more common in women 60 to 75 years of age
 - excess of gastrointestinal malignancies
55. Those affected with ataxia telangiectasia have a hypersensitivity to:
- shellfish
 - radiation
 - nitrites
 - penicillin
56. _____ syndrome is characterized by melanocytic macules on the lips, perioral and buccal regions and multiple gastrointestinal polyps.
- Cowden
 - Peutz-Jeghers
 - Ataxia telangiectasia
 - Li-Fraumeni
57. *BACH1* is also known as:
- STK11
 - PT53
 - BRIP1*
 - BRCA1*
58. Similar to *BRIP1* and *BRCA2*, biallelic mutations in ____ have also been shown to cause Fanconi anemia.
- CASP8
 - TGFB1
 - STK11
 - PALB2

Part 5

59. In the general population, strong evidence suggests that regular mammography screening of women aged 50 to 59 years' leads to a ___% to ___% reduction in breast cancer mortality.
- 5 – 15
 - 25 – 30
 - 45 – 50
 - 60 – 65
60. According to the reference, in one study mean tumor doubling time in *BRCA1/2* gene mutation carriers was ___ days.
- 15
 - 25
 - 45
 - 65
61. The Cancer Genetics Studies Consortium task force has recommended for female carriers of a *BRCA1* or *BRCA2* high-risk mutation that:
- annual mammography should begin at age 25 to 35 years
 - mammograms should be done at a consistent location when possible
 - prior films should be available for comparison
 - all of the above
62. Of the combined studies for detection of hereditary breast cancer, magnetic resonance imaging (MRI) identified ___% of the cancers as compared to 40% by mammography.
- 82
 - 75
 - 60
 - 35
63. Most of the mammography detected cancers in women with a negative MRI appear to be:
- tubular
 - mucinous
 - medullary carcinoma
 - ductal carcinoma *in situ*
64. A screening study comparing digital and routine mammography found that digital mammography resulted in:
- fewer recalls
 - lower cancer detection rates
 - higher cancer detection rates
 - decrease in contrast resolution

65. In a multicenter, breast cancer case-control study, among *BRCA1* mutation carriers, breastfeeding for 1 year or more was associated with approximately ___% reduced risk of breast cancer.
- 15
 - 25
 - 30
 - 45
66. Use of oral contraceptives among *BRCA1* mutation carriers is associated with a statistically significant 20% increase in breast cancer risk, particularly if use:
- began after 1980
 - began after age 35
 - lasted for 5 or more years
 - occurred when estrogen doses were relatively low
67. In the National Surgical Adjuvant Breast and Bowel Project, Breast Cancer Prevention Trial (NSABP-P1), tamoxifen was shown to reduce the risk of invasive breast cancer by ___%.
- 85
 - 62
 - 49
 - 27
68. According to data from the Prevention and Observation of Surgical End Points study group, of 105 mutation carriers who underwent bilateral risk-reducing mastectomy (RRM), the risk of breast cancer after a mean follow-up of 6.4 years was approximately reduced by ___%.
- 90
 - 80
 - 70
 - 60
69. In the general population, removal of both ovaries has been associated with a reduction in breast cancer risk of up to ___% depending on parity, weight, and age of artificial menopause.
- 95
 - 75
 - 55
 - 35
70. Women with founder Ashkenazi Jewish (AJ) mutations were over ___ times more likely than women without mutations to develop contralateral breast cancer.
- 3
 - 5
 - 10
 - 15

71. The Cancer Genetics Studies Consortium Task force recommends that female carriers of a *BRCA1* high-risk mutation undergo annual or semiannual screening using transvaginal ultrasound (TVUS) and serum CA 125 levels beginning at age ___ to ___ years.
- a. 15-20
 - b. 25-35
 - c. 40-45
 - d. 50-65
72. Among the general population, parity decreases the risk of ovarian cancer by ___%.
- a. 15
 - b. 25
 - c. 45
 - d. 65
73. The average age of ovarian cancer in *BRCA1* mutation carriers is:
- a. 24
 - b. 35
 - c. 48
 - d. 56

Part 6

74. Although 78% of test decliners/deferrers felt that their health was at risk, they reported that learning about their *BRCA1/2* mutation status would cause them to worry most (76%) about:
- a. loss of their job
 - b. their own health
 - c. their life insurance
 - d. their children's health
75. The more important factor in the decision to decline genetic testing was cited as:
- a. apprehension about the impact of the test results
 - b. financial costs associated with counseling and testing
 - c. time required to travel to a genetic clinic
 - d. work, family, and social obligations
76. A general tendency to overestimate inherited risk of breast and ovarian cancer has been noted in at-risk populations.
- a. True
 - b. False

77. A qualitative study of 22 men from 16 high-risk families in Ireland revealed that their decision to undergo genetic testing was related to whether:
- their insurance company would pay for the testing
 - male breast cancer had occurred in their family
 - they had a daughter or daughters
 - their mother had been diagnosed with breast or ovarian cancer
78. Across all studies, the rate of *BRCA* test results to at-risk children ranging in age from 4 to 25 years is approximately ____%.
- 15
 - 25
 - 50
 - 75
79. Testing for *BRCA1/2* has been almost universally limited to adults older than 18 years.
- True
 - False
80. Eugenics refers to the use of genetic knowledge to:
- select a genetic counselor
 - determine the best course of treatment
 - regulate parenthood
 - share the information with extended family
81. In a study of healthy women who underwent risk-reducing mastectomy, 76.6% reported:
- either no change in body image or improvement in body image
 - worsening self-image after surgery
 - increased distress levels after surgery
 - worsening sexual life
82. In a retrospective questionnaire study of 583 women with a personal and family history of breast cancer and who underwent contralateral prophylactic mastectomy, overall ____ % of all participants stated that they were satisfied or very satisfied.
- 96
 - 83
 - 70
 - 54

Part 7

83. All of the following are true about HER2-positive breast cancer, **except**:
- a. is fast growing
 - b. is considered aggressive
 - c. the drug trastuzumab is effective as a treatment
 - d. about 50% to 75% of women with breast cancer have HER2-positive tumors
84. A 2+ score on the immunohistochemistry (IHC) test is:
- a. HER2-negative
 - b. HER2-positive
 - c. borderline or equivocal
 - d. indeterminate

Part 8

85. The Breast Cancer Risk Assessment tool **only** calculates risk for women ____ years of age or older.
- a. 20
 - b. 25
 - c. 30
 - d. 35

Part 9

86. Candidates for genetic counseling include people with:
- a. multiple primary cancers
 - b. cancers associated with birth defects
 - c. a diagnosis of cancer at an atypically young age
 - d. all of the above
87. A standardized graphic representation of family relations in which patterns of disease transmission are tracked is referred to as a:
- a. cosegregation
 - b. familial track
 - c. pedigree
 - d. kindred
88. In a family history having a minimum of ____ generations will help identify inheritance patterns.
- a. 2
 - b. 3
 - c. 5
 - d. 6

89. The genetic relatedness between individuals descended from at least one common ancestor is referred to as:
- consanguinity
 - cosegregation
 - de novo*
 - microsatellite
90. In taking a family history, for any relative **not** affected with cancer, collect information regarding:
- current age or age at death
 - if deceased, cause of death
 - whether routinely screened for cancer
 - all of the above
91. The manner in which a genetic trait or disorder is passed from one generation to the next is referred to as:
- mode of inheritance
 - de novo* mutation
 - genomic imprinting
 - penetrance
92. **All** of the following are examples of diseases that fit the Mendelian trait inheritance pattern, **except**:
- sickle-cell anemia
 - Tay-Sachs disease
 - cystic fibrosis
 - diabetes
93. Non-Mendelian forms of inheritance include **all** of the following, **except**:
- autosomal dominant
 - chromosomal
 - multifactorial
 - mitochondrial
94. When the affected person has one copy of a mutated allele and one allele is functioning normally, the type of inheritance is referred to as:
- chromosomal
 - X-linked
 - autosomal dominant
 - multifactorial
95. In X-linked recessive inheritance, male and female offspring have a ___% chance of inheriting the mutated allele from the carrier.
- 75
 - 50
 - 25
 - 5

96. Chromosomal disorders generally are **not** inherited conditions rather they occur as ____ error in meiosis at the time of concept of a given individual.
- autosomal dominant
 - multifactorial
 - de novo*
 - X-linked
97. Examples of chromosomal disorders with increase risk of malignancy include leukemia associated with:
- Down syndrome
 - Parkinson's disease
 - Tay-sachs disease
 - spina bifida
98. Disease inheritance caused by genetic and environmental factors is referred to as:
- de novo*
 - multifactorial
 - X-linked
 - autosomal recessive
99. The occurrence of 2 or more cell lines with different genetic or chromosome makeup within a single individual or tissue is referred to as:
- mosaicism
 - de novo*
 - consanguinity
 - genomic imprinting
100. When beginning a risk assessment counseling session, the most important factor in determining decisions about screening and other risk-reduction strategies **may** be the:
- counselors attitude about risk-assessment
 - availability of testing laboratories
 - the person's perception of his or her cancer risk
 - ability to financially pay for testing and counseling
101. The statement "you have a 3-fold increased risk of colorectal cancer" is an example of a ____ risk estimate.
- assumed
 - perceived
 - relative
 - absolute

102. Potential benefits and burdens of a negative test result when a disease-related mutation has been identified in the family, include **all** of the following, **except**:
- reassurance and reduction of anxiety about personal cancer risk due to heredity
 - relief that children are not at increased risk
 - adjustments to the change in expected life course
 - potential insurance, employment, or social discrimination
103. The primary component of the posttest session is:
- result notification
 - informing extended family members
 - determining level of risk
 - deciding on available interventions

Part 10

104. Estimates based on the International HapMap Project Phase 2 indicate that a minimum of ___ carefully chosen single nucleotide polymorphisms (SNPs) would be required to conduct a dense whole genome SNP scan.
- 10,000
 - 100,000
 - 350,000
 - 550,000

Part 11

105. A report released in 2009 by the National Council on Radiation Protection and Measurements (NCRP) noted that in 2006 Americans were exposed to more than ___ times, as much ionizing radiation from medical procedures as was the case in the early 1980s.
- 3
 - 5
 - 7
 - 9
106. The executive director of the NCRP cited ___ as a preventable driver of the dramatic increase in radiation exposure.
- emergency room visits
 - defensive medicine
 - self referral
 - aging population
107. Scientific committees starting in the ___s evaluated risk estimates for radiation workers.
- 1930
 - 1940
 - 1950
 - 1960

108. The degree to which a diagnostic study accurately reveals the presence or absence of disease in a patient is referred to as diagnostic:
- accuracy
 - efficacy
 - efficiency
 - precision
109. The Mammography Quality Standards Act (MQSA) regulations requires that the radiation dose to the breast must **not** exceed ___ rad.
- 0.1
 - 0.3
 - 1.0
 - 1.5
110. As discussed in the International Commission on Radiation Protection (ICRP) publication number 84, the radiation risk is highest during organogenesis, a period from ___ to ___ weeks after conception.
- 2 – 7
 - 10 – 12
 - 15 – 20
 - 24 – 28
111. The NCRP guidelines recommend that a monthly equivalent radiation dose limit for the embryo should **not** exceed ___ rem once the pregnancy becomes known.
- 0.05
 - 1.0
 - 1.5
 - 2.0
112. The glandular breast dose is approximately ___% of the entrance skin exposure in mammography.
- 3
 - 5
 - 10
 - 15
113. The best measurement indicator of risk is:
- mean glandular breast measurement
 - mid-line measurements
 - in-air exposure at the surface of the breast
 - surface dose

114. The failure to maintain consistent exposures when extremely short or long exposure times are used is known as ___ law failure.
- linearity
 - reciprocity
 - heel-effect
 - gravitational
115. The type of filter usually used for small and average sized breast thickness is:
- aluminum
 - tungsten
 - rhodium
 - molybdenum
116. An effect, which allows for greater radiation intensity on the cathode side of the x-ray tube, is referred to as:
- reciprocity
 - heel effect
 - line focus principle
 - inverse square law
117. **All** of the following are true regarding breast compression, **except**:
- creates a more uniform tissue thickness
 - results in an increased radiation dose
 - allows for a more uniform image density
 - improves image quality
118. In magnification mammography, the radiation dose to the breast:
- increase
 - decreases slightly
 - decreases drastically
 - remains the same
119. In mammography, CAD detection schemes are capable of detecting ___% to ___% of breast cancers.
- 25-35
 - 40-50
 - 60-75
 - 80-90
120. **All** of the following are true regarding CAD, **except**:
- the purpose of CAD is to identify and highlight hard-to-find features and anomalies on medical images
 - the ACR recommends that all mammography CAD algorithms should use "for presentation" image data
 - in the future certain CAD schemes are expected to increase the radiologists' reading time
 - breast advocacy groups recognize the benefits of CAD