**Chapter 18**

**Cancer Genetics and Genomics**

**Multiple Choice Questions**

1. The probability of cancer development in the general population is one is \_\_\_\_\_ people.   
A. two  
**B.** three  
C. four  
D. five

**True / False Questions**2. Mitosis in a cancer cell can be compared to a runaway train that is racing along without signals and control points.   
**TRUE**

**Multiple Choice Questions**

3. A cancer's spread is called   
**A.** metastasis.  
B. malignancy.  
C. carcinogenesis.  
D. microstasis.

4. Cancer does not typically follow a Mendelian pattern of inheritance because it is usually caused by   
A. two gene variants, one dominant and one recessive, and no environmental input.  
**B.** specific combinations of alleles and an environmental factor.  
C. specific combinations of an environmental factor and one dominant gene variant.  
D. genes that cause death before birth.

5. A \_\_\_\_\_ mutation is one that is present in every cell of an individual, including gametes.   
A. somatic  
B. sporadic  
**C.** germline  
D. benign

6. All cancers reflect, at the most general level, a defect in   
A. DNA replication.  
B. the formation of mitochondria.  
C. cell membrane structure.  
**D.** the cell cycle.

7. In normal differentiated somatic cells, telomerase   
A. adds material to the ends of chromosomes with each cell division.  
**B.** is not expressed and telomere tips erode with each division.  
C. removes telomere tips with each division.  
D. repairs double strand breaks in DNA.

8. Sporadic cancers result from   
**A.** recessive or dominant mutation in a somatic cell.  
B. recessive or dominant germline mutation.  
C. mutation in a sperm or oocyte.  
D. exposure to a cancer-causing virus.

9. Dana Reeve, the wife of actor Christopher Reeve, died at a young age from lung cancer, although she had never smoked. Her cancer was likely caused by   
**A.** a germline mutation.  
B. two somatic mutations in the same lung cell.  
C. exposure to carcinogens.  
D. stress from caring for her husband, who had a spinal cord injury.

10. Cancer cells   
A. divide uncontrollably and then die.  
B. are particularly sensitive to extracellular signals.  
**C.** divide uncontrollably and are immortal.  
D. are impossible to grow in culture.

11. Cancer cells are not   
**A.** contact inhibited.  
B. transplantable.  
C. invasive.  
D. immortal.

12. A cancer cell is injected into a healthy mouse. The mouse develops tumors. This experiment indicates that cancer is   
A. contact inhibited.  
**B.** transplantable.  
C. benign.  
D. invasive.

13. The term used to describe the fact that cancer cells have lost the specializations of the cells from which they descend is   
A. heritable.  
B. angiogenic.  
C. oncogenic.  
**D.** dedifferentiated.

14. Growth of new blood vessels in and around tumors is called   
A. invasiveness.  
**B.** angiogenesis.  
C. metastasis.  
D. dedifferentiation.

**True / False Questions**

15. Invasive malignant tumors typically contain mutations that affect the cytoskeleton and allow the cell to move from where it is anchored.   
**TRUE**

16. Pancreatic cancer typically begins 10 to 15 years before it causes abdominal pain, and by the time diagnosis usually occurs, it has usually reached the point where it is lethal within two years.   
**TRUE**

**Multiple Choice Questions**

17. After mutations begin a cancer, other factors that influence whether the disease proceeds include   
A.  how old a person is and whether he or she smokes.  
B.  whether a person has had cancer before and its location in the body.  
**C.**  location of the cancerous cell in the tissue and how specialized the cell is.  
D.  whether or not a person's relatives have cancer.

18. A cancer stem cell can divide to give rise to   
**A.** tumor cells, abnormal daughter cells, normal cells, and more cancer stem cells.  
B. more cancer stem cells only.  
C. healthy stem cells and normally differentiated cells.  
D. invasive cells and metastatic malignant cells. 

19. The connection between stem cells and cancer is that   
A. all stem cells are also cancer cells.  
**B.** cells may become cancerous by expressing "stemness" genes.  
C. stem cells rescue cells that have become cancerous.  
D. both stem cells and cancer cells have inactivated telomerase.

20.  Mutations that enable cancer cells to grow and divide faster than other normal cells are known as \_\_\_\_\_ mutations.   
A. benign  
B. gateway  
C. passenger  
**D.** driver

21. A \_\_\_\_\_ mutation does not cause or propel a cancer's growth and spread.   
**A.** passenger  
B. driver  
C. somatic  
D. germline

22. When tumor cell DNA is examined from people at different stages of the same cancer type, mutations that are common to all of them   
**A.** act early in the disease.  
B. act late in the disease.  
C. acted on an initial cell and then reverted to wild type.  
D. entered the cells on the same type of virus.

23. A gatekeeper gene   
A. regulates mitosis and meiosis.  
B. regulates its own mutation rate.  
C. can destabilize the genome when mutant.  
**D.** regulates apoptosis and mitosis.

24. The first mutation typically detected in FAP (familial adenomatous polyposis) colon cancer is   
**A.** *APC*.  
B. *TGF*.  
C. *p*53.  
D. *PRL*-3.

**True / False Questions**

25. Research has shown that a “cocktail” of several drugs, each acting on a different cellular pathway, is the best approach to treat many cancers.   
**TRUE**

**Multiple Choice Questions**

 26.  The oncogene that causes Burkitt lymphoma results from a   
**A.** translocation that moves a proto-oncogene next to an antibody gene.  
B. point mutation in a proto-oncogene.  
C. virus that inserts next to a proto-oncogene.  
D. deletion of an anti-oncogene.

27. A proto-oncogene can become an oncogene when   
**A.** it is translocated next to a highly expressed gene.  
B. it is translocated next to a gene that is not being expressed.  
C. checkpoints are added to the cell cycle.  
D. the cell cycle temporarily runs backwards.

28.  A(n) \_\_\_\_\_ is a type of cancer-causing gene that promotes cancer by activating cell division at an inappropriate time or place.   
A. DNA repair gene  
B. tumor suppressor gene  
**C.** oncogene  
D. teratoma

29.  Chronic myelogenous leukemia is caused by a translocation that creates   
A. a proto-oncogene.  
B. a fusion protein that acts like a transcription factor, activating cell cycle control genes.  
C. a protein that increases growth factor production.  
**D.** a fusion protein that deregulates the cell cycle of myeloid white blood cells.

30. Genes that normally prevent cell division are   
**A.** tumor suppressors.  
B. transcription factors.  
C. proto-oncogenes.  
D.  oncogenes.

31. Loss of tumor suppression in a cell usually results from   
A. a translocation of a tumor suppressor gene.  
B. an inversion involving a tumor suppressor gene.  
**C.** a deletion of a tumor suppressor gene.  
D. activation of a proto-oncogene by a virus.

32.  Matthew has the inherited form of the eye cancer retinoblastoma (RB). His disease is caused by   
A. a germinal mutation in one RB allele and no mutation in the other allele.  
B. a somatic mutation in each copy of the RB gene in the same cell.  
**C.** a germinal mutation in one RB allele and a somatic mutation in the other allele.  
D.  a somatic mutation in one of the RB genes in the same area of the retina of one eye.

33.  Tanisha was just diagnosed with an aggressive form of breast cancer called HER2. The cancer started because   
A. she has a deletion in the *BRCA1* gene that is found in African-American and Ashkenazi Jewish women.  
**B.** her affected breast cells have many extra receptors for epidermal growth factor, and so they receive too many signals to divide.  
C. her affected cells have extra genes for epidermal growth factor, sending signals for the cells to divide too frequently.  
D. a translocation occurred between chromosomes 7 and 8, generating and activating a breast-specific oncogene.

34. In Wilms' tumor,   
A. heart cells divide as frequently as do cells in the skin.  
B.  being exposed to cigarette smoke in the uterus causes lung cancer in infants.  
**C.** cells in a child's kidney divide as frequently as if they were still in a fetus.  
D. deletion of the retinoblastoma gene causes an eye tumor.

35. The cause of *p53*-related cancers is   
A. fetal cells that remain in a child or adult, dividing too frequently.  
B. continual expression of the telomerase gene, which keeps cells dividing.  
C. deletion of cell cycle checkpoint genes.  
**D.** failure to repair damaged DNA, allowing the cell to continue dividing.

 36.  A missense mutation in the \_\_\_\_\_ gene, a tumor suppressor, results in stomach cancer.   
A.  HER2  
B.  RB1

**C.**  E-cadherin  
D.  CML

37. *BRCA1* and *BRCA2* mutations are   
A. X-linked.  
**B.** incompletely penetrant.  
C. translocations.  
D. somatic mutations.

**True / False Questions**

38. In addition to activated oncogenes and inactivated tumor suppressor genes, epigenetic changes in gene expression are seen in cancer.   
**TRUE**

**Multiple Choice Questions**

 39. Which of these are thought to have anti-cancer benefits?   
A.  Heterocyclic aromatic amines (HAs)  
**B.**  Cruciferous vegetables such as broccoli  
C.  Red meats  
D.  Baked potatoes

 40. Surgery is an effective method of treating cancer when   
A. a primary tumor has spread through the blood stream.  
**B.** a primary tumor is yet to invade healthy tissue.  
C.  all rapidly dividing cells are targeted by the surgery.  
D. a patient has multiple tumors spread across his or her body.

41. One of the challenges associated with eradicating cancer is its   
A. simplicity.  
**B.** heterogeneity.  
C. homogeneity.  
D. heterozygosity.

42.  Caley, a 30-year-old nurse at Bethson Hospital, is diagnosed with a brain tumor. Caley's doctor presents her with multiple treatment options. Which of the following treatment options is most likely to damage Caley's healthy cells in addition to the cancer cells?   
**A.**  Chemotherapy  
B.  Surgery  
C.  Liquid biopsy  
D.  Tyrosine kinase inhibitors

43. Traditional cancer treatments include   
**A.** surgery, chemotherapy, and radiation.  
B. nutritional therapy and physical therapy.  
C. monoclonal antibodies and cytokines.  
D. gene therapy.

44. A more recently developed cancer treatment is   
A. stimulating telomerase activity.  
B. stimulating cells to return to a stem-like state of specialization.  
**C.**  inhibiting kinases based on genetic information.  
D. replacing the nuclei in cancer cells.

45. A more realistic goal than eradicating cancer is to   
**A.** slow cancer spread and convert it to a chronic, manageable condition.  
B. genetically engineer human beings, making them cancer resistant.  
C. suppress cell division and increase the longevity of human cells.  
D. genetically engineer cancer cells, making them benign.