

**Directions:** Read each question carefully and completely. Select the **ONE BEST** answer and record your choice by **CAREFULLY** blackening the proper space on your answer sheet with a #2 pencil. If you make a mistake, erase your old answer completely.

1. The genetic material of most prokaryotes is arranged in a ----- molecule of -----  
 A. linear; DNA      B. circular; DNA      C. circular; RNA  
 D. linear; RNA      E. none of the above
2. In most prokaryote, the DNA is  
 A. a double helix      B. a circular molecule      C. supercoiled  
 D. B and C      E. none of the above
3. Chromatin contains  
 A. DNA      B. RNA      C. proteins      D. all of the above
4. Which of the following is a non-histone protein found in chromatin?  
 A. H1      B. HMG      C. H2A      D. H5      E. all of the above
5. A nucleosome contains  
 A. DNA      B. histones H2A, H2B      C. histones H3, H4      D. all of the above
6. Most of the genome of an active cell consists of  
 A. heterochromatin      B. euchromatin      C. polychromatin  
 D. histochromatin      E. none of the above
7. The genome of most prokaryotes consists of ----- DNA  
 A. unique sequence      B. moderately repetitive      C. highly repetitive  
 D. both unique sequence and repetitive sequence
8. Genetic counselors determine the risk of a genetic disease in a family by first performing  
 A. DNA finger printing      B. amniocentesis      C. pedigree analysis  
 D. RFLP mapping      E. genome sequencing
9. Amniocentesis is best performed  
 A. before the end of the first trimester      B. on the tenth day after conception  
 C. after the twelfth week of pregnancy      D. at the end of the second trimester
10. Chorionic villus sampling is best performed during which stage of pregnancy?  
 A. during the first trimester      B. after the twelfth week  
 C. after the twenty-sixth week      D. after the thirtieth week
11. Which of the following is a highly polymorphic region of DNA that can be used for DNA typing?

9 min  
 2 min  
 12 min

- A. ASO      B. VNTR      C. PCR      D. all of the above
12. Which type of cells could be used for somatic cell gene therapy?  
 A. ovum      B. sperm      C. skin cell      D. all of the above
13. ----- are a type of DNA marker used in genetic mapping.  
 A. restriction fragment length polymorphism  
 B. variable number of tandem repeats  
 C. single tandem repeats      D. single nucleotide polymorphism  
 E. all of the above
14. RFLPs occur as a result of a mutation that causes  
 A. the addition of a restriction site      B. a change in the number of VNTR  
 C. the loss of bases between restriction sites      D. both A and C
15. A key issue being considered by the bioethics program known as ELSI is  
 A. maintaining the privacy of genetic information  
 B. the safe and effective introduction of genetic information in a clinical setting  
 C. the fair use of genetic information  
 D. professional and public education  
 E. all of the above
16. The development of adult body structures in *Drosophila* depends upon  
 A. the position of the nucleus along a molecular gradient  
 B. the pattern of parasegments in the cellular blastoderm  
 C. both A and B  
 D. neither A or B
17. In *Drosophila*, development is controlled by which type of gene?  
 A. maternal      B. segmentation      C. homeotic      D. all of the above
18. In *Drosophila*, ----- in the larvae differentiate and become structures in the adult fly.  
 A. polytene chromosome      B. imaginal disks      C. homeodomains
19. ----- mutations in *Drosophila* alter the identity of a particular body segment.  
 A. maternal      B. segmentation      C. homeotic      D. all of the above
20. The development of cancer may be linked to  
 A. inherited genetic defects      B. infection with a virus  
 C. exposure to mutagenic chemicals      D. all of the above
21. The two hit model for cancer development suggests that  
 A. all types of cancer are hereditary  
 B. cancers are caused by two mutational events in a cell's life  
 C. all of the above      D. none of the above

22. The hereditary predisposition to cancer is related to  
 A. inheriting one mutant allele of a cancer-causing gene  
 B. inheriting mutant genes for immune system function  
 C. exposure to mutagenic agents in the environment  
 D. none of the above
23. Which type of gene is often mutated in cancer?  
 A. protooncogene      B. tumor suppressor gene      C. mutator gene  
 D. all of the above
24. A mutant protooncogene is a  
 A. mutator      B. suppressor      C. oncogene      D. growth factor
25. Retroviruses are responsible for which of the following conditions?  
 A. Rous sarcoma      B. AIDS      C. feline leukemia      D. all of the above
26. Growth factors, receptors and nonreceptor protein tyrosine kinases and membrane associated G proteins are gene products of  
 A. oncogenes      B. tumor suppressor genes      C. plasmid encoded genes  
 D. viral oncogenes      E. protooncogenes
27. Metastatic cancer is  
 A. terminally differentiated      B. malignant      C. invasive  
 D. both B and C      E. all of the above
28. In normal cells tumor suppressor genes  
 A. activate cell growth      B. regulate cell growth      C. transform cells  
 D. are not found      E. none of the above
29. Which of the following is a protooncogene that functions as a nuclear transcription factor?  
 A. myc      B. fos      C. jun      D. all of the above
30. Mutations in tumor suppressor genes are  
 A. dominant      B. recessive      C. co-dominant      D. epistatic
31. Which of the following is a tumor suppressor gene linked to many different types of human cancer?  
 A. myc      B. p53      C. RB      D. ras      E. all of the above
32. Retinoblastoma will develop if  
 A. one allele of the RB gene is mutant  
 B. one mutant RB allele is inherited and the other allele is later mutated  
 C. two normal RB alleles are inherited and both are later mutated  
 D. both B and C      E. all of the above

33. In normal cells, p53 protein acts as a (n)  
 A. transcription factor      B. adhesin      C. GTPase activator  
 D. mutator      E. all of the above
34. The BRCA1 gene is a  
 A. tumor suppressor      B. protooncogene      C. enhancer element  
 D. viral gene      E. none of the above
35. Chemical and physical agents that increase the frequency of cancers are called  
 A. antigens      B. teratogens      C. carcinogens      D. keratogens
36. In normal cells, the p53 protein is involved in important cellular processes, including  
 A. transcription      B. cell cycle control      C. DNA repair  
 D. apoptosis      E. all of the above
37. A mutator gene is likely to be involved in which of these normal cellular activities?  
 A. DNA replication      B. mismatch repair      C. nucleotide excision repair  
 D. all of the above      E. none of the above
38. Scientists involved in which area of genetics study involving heredity in groups of individuals when only one or a few genes determine the trait of interest?  
 A. transmission genetics      B. molecular genetics      C. population genetics  
 D. quantitative genetics
39. A group of interbreeding individuals who share a common set of genes is referred to as (a)  
 A. Hardy-Weinberg population      B. Lamarckian nonvariants  
 C. Darwinian gene pool      D. Mendelian population
40. For the Hardy-Weinberg model to be applicable, the population must be  
 A. very large      B. randomly mating      C. free of mutation  
 D. non-migratory      E. all of the above
41. According to the Hardy-Weinberg law, when a population is in equilibrium, the genotypic frequency of the heterozygote will be  
 A. p      B. q      C.  $p^2$       D.  $q^2$       E. 2pq
42. To describe the gene pool of a group, population geneticists can mathematically determine  
 A. genotypic frequencies in the population  
 B. allelic frequencies for a genetic locus  
 C. the Hardy-Weinberg equilibrium  
 D. all of the above
43. For a particular gene A, a geneticist studying a population of beetles found the following genotypes:

AA	45 beetles
Aa	347 beetles
aa	8 beetles

What is the genotypic frequency for the Aa genotype?

- A. 0.020      B. 0.113      C. 0.868      D. 1.000

44. To calculate the allelic frequencies for a particular gene in a population accurately, a population geneticist can
- observe the number of different genotypes at the locus
  - calculate the genotypic frequency of the locus
  - estimate the number of alleles at the locus
  - both A and B

45. A population of 500 individuals show the following genotypes at a particular genetic locus

TT	250
Tt	150
tt	100

What is the allele frequency of the T allele?

- A. 0.100      B. 0.250      C. 0.500      D. 0.650      E. 1.000

46. If the genotypic frequencies for a particular allele are 0.635 homozygous dominant, 0.430 heterozygotes, and 0.125 homozygous recessives, what is the allelic frequency of the recessive allele?

- A. 0.125      B. 0.340      C. 0.430      D. 0.555      E. 1.000

47. When the conditions of the Hardy-Weinberg law are met, the model implies that
- allele frequencies will not change
  - genotypic frequencies can be determined from the allelic frequencies
  - the allelic frequencies will occur in the proportions  $p^2$ ,  $2pq$  and  $q^2$
  - all of the above
  - none of the above

48. Through which natural process would it be possible to alter the frequencies of alleles within a population?

- A. mutation      B. genetic drift      C. migration      D. natural selection  
E. all of the above

49. Which method can be used to assess genetic variation in a population?

- A. protein electrophoresis      B. phenotypic observation  
C. DNA sequencing      D. RFLP analysis      E. all of the above

50. What experimental technique for assessing genetic variation involves restriction enzymes?

- A. protein electrophoresis      B. DNA sequencing      C. RFLP analysis