## Chapter 2. Basic Genetics

## Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. When 1,000 donors were tested, $75 \%$ were positive for C and $25 \%$ were negative for C ; the gene frequency of C is:
a. 10 .
b. 1 .
c. 0.5 .
d. 25 .
$\qquad$ 2. All of the following may cause an alteration in DNA, except:
a. ultraviolet light.
c. antibodies.
b. alkylating agents.
d. enzymes.
2. How is it genetically possible for a child to type Rh-negative?
a. Both parents are Dd.
c. Mom is DD and Dad is Dd.
b. Both parents are DD.
d. Sibling is Rh-positive.
$\qquad$ 4. All of the following are included in transcription except:
a. mRNA terminates at the 5 ' end.
b. RNA polymerase II binds to a promoter.
c. it proceeds from the $3^{\prime}$ end to the $5^{\prime}$ end.
d. the 5 ' end is capped with a methyl residue.
$\qquad$ 5. Which of the following best describes the structure of human chromosomes?
a. Linear strands of DNA wound around histones
b. Linear strands of RNA wrapped around histones
c. Tertiary structure of DNA wound around histones
d. Quaternary structure of DNA wound around histones
3. In Mendel's law of separation, the first-filial generation is:
a. recessive.
c. heterozygous.
b. homozygous.
d. autologous.
$\qquad$ 7. A father carries the $\mathrm{Xg}^{\mathrm{a}}$ trait and passes it on to all of his daughters but none of his sons. What type of inheritance does this represent?
a. Autosomal dominant
c. X-linked recessive
b. X-linked dominant
d. Autosomal recessive
4. Methods to isolate intact DNA in order for it to be studied include all of the following except:
a. pH changes.
c. detergent lysis.
b. enzyme activation.
d. heat treatment.
$\qquad$ 9. Point mutations include which of the following?
a. Substitutions
b. Insertions
c. Deletions
d. Substitutions, insertions, and deletions
5. Which of the following best describes the process of mitosis?
a. Cell division by which only one-half of the daughter cells produced are identical to the parent cell
b. Cell division of germ cells by which two successive divisions of the nucleus produce cells that contain half the number of chromosomes of somatic cells
c. Cell division that produces two daughter cells having the same number of chromosomes as the parent
d. Cell division that produces four daughter cells (4n)
6. All of the following processes occur in replication, except:
a. the two DNA strands separate via helicase.
b. DNA polymerase acts on the $5^{\prime}$ to $3^{\prime}$ parent strand to produce an anticomplementary duplicate strand.
c. DNA polymerase acts on the $3^{\prime}$ to $5^{\prime}$ parent strand to produce an anticomplementary duplicate strand.
d. replication of the $3^{\prime}$ to $5^{\prime}$ parent strand is initiated by the enzyme primase, which anneals to the parent strand.
7. Which type of genetic change (mutation) is incapable of reverting back to the original phenotype?
a. Duplication
c. Recombination
b. Deletion
d. Insertion
8. In the MN blood group system, a person who inherits an " M " allele and an " N " allele expresses both M and N antigens on the RBCs. Which of the following is true?
a. M is dominant to N .
b. N is dominant to M .
c. M an N are codominant alleles.
d. M and N are located on the same chromosome.
9. A gene, such as the $O$ gene, that produces no detectable product is called:
a. an amorph.
c. an allele.
b. a trait.
d. recessive.
10. What blood group is the best example of codominantly inherited blood group genes?
a. Rh
c. Lewis
b. MN
d. ABO
11. When an individual is said to have blood group A , it refers to the individual's:
a. alleles on the chromosome.
c. phenotype.
b. genotype.
d. haplotype.
12. The two strands of DNA are: $\qquad$ ; one runs in a $5^{\prime}$ to $3^{\prime}$ direction, and the other runs in a $3^{\prime}$ to $5^{\prime}$ direction.
a. parallel
c. somatic
b. antiparallel
d. zigzag
13. In what stage of mitosis is DNA not actively dividing?
a. Interphase
c. Metaphase
b. Prophase
d. Anaphase
14. How many chromosomes do somatic cells of humans have?
a. 46
b. 50
c. 23
d. 100
15. The diploid chromosome number in humans is:
a. 12
c. 46
b. 23
d. 92
16. Which constituent in the Hardy-Weinberg equation represents the total number of alleles?
a. q
c. 2 pq
b. p
d. $\mathrm{q}^{2}$
17. In which of the following circumstances will Hardy-Weinberg's principle fail?
a. Mutation
c. Nonrandom mating
b. Genetic drift
d. All the above
18. What amino acid initiates translation by attaching to tRNA?
a. Glycine
c. Methionine
b. Alanine
d. Lysine
19. What is meant by the term autosomal?
a. Trait is not carried on the sex chromosomes
b. Trait is carried on sex chromosomes
c. Trait is not expressed in the parents
d. Organism possesses different alleles for a given characteristic
20. Which of the following best describes classical genetics?
a. DNA alteration that is caused by a physical or chemical agent
b. Transmission of characteristics from parents to offspring
c. Possessing a pair of identical alleles
d. The synthesis of RNA from DNA requiring RNA polymerase
21. How is RNA different from DNA?
a. RNA usually exists as one strand
c. RNA incorporates uracil
b. Ribose is substituted for deoxyribose
d. All of the above
22. Using the Hardy-Weinberg equation, if a total random population carried the dominant allele E and 20\% carried the recessive allele e, what would the total percentage be for the recessive trait ee?
a. $64 \%$
b. $4 \%$
c. $16 \%$
d. $0.4 \%$
23. A triple set of nucleotides is a:
a. helix.
c. codon.
b. base.
d. template.
24. A human gamete (egg or sperm) contains how many chromosomes?
a. 23 pairs
b. 46 pairs
c. 23 chromosomes
d. 46 chromosomes
25. How do restriction endonucleases function?
a. Disrupt hydrogen bonding in DNA structure
b. Promote digestion of RNA
c. Cut DNA into smaller fragments
d. Terminate translation of mRNA
26. DNA is composed of all of the following except:
a. adenine.
c. cytosine.
b. guanine.
d. uracil.
27. A woman with blood group A marries a man with blood group O . Their firstborn child has blood group O . The mother's most probable genotype is:
a. OO
c. AB
b. AA
d. AO
28. A structural alteration of DNA in an organism that is caused by a physical or chemical agent is called:
a. transcription.
c. mutation.
b. translation.
d. cloning.
29. In a pedigree analysis, what do vertical lines indicate?
a. Consanguineous mating
c. Stillbirth
b. Offspring
d. Deceased sibling
30. What is a vector?
a. Substance capable of catalyzing a reaction
b. Sequence of three bases in a strand of DNA
c. Extrachromosomal genetic element that can carry a recombinant DNA molecule into a host bacterial cell
d. Substance that can carry an electric current in solution
31. Which of the following must be true when using the Hardy-Weinberg equation?
a. The population must be large
c. Mating must occur randomly
b. Mutations cannot occur
d. All of the above
32. Alternate forms of a gene that can occur at a single chromosome locus are referred to as:
a. amorphs.
c. alleles.
b. traits.
d. recessive.
33. The condition in which one chromosome has a copy of the gene and the other chromosome has that gene deleted or absent is referred to as:
a. homozygous.
c. hemizygous.
b. heterozygous.
d. recessive.
34. Most antigens in the various blood group systems follow what kind of inheritance patterns?
a. Codominant
c. Dominant
b. Homozygous
d. Autosomal
35. All of the following are consistent with Mendel's basic rules of inheritance except:
a. the gene is transmitted through generations intact.
b. a pair of genes is always found in the same gamete.
c. different pairs of genes are assorted independently of each other.
d. a pair of genes is rarely found in the same gamete.

## Chapter 2. Basic Genetics Answer Section

## MULTIPLE CHOICE

| 1. ANS: C | PTS: 1 |
| :---: | :---: |
| 2. ANS: D | PTS: 1 |
| 3. ANS: A | PTS: 1 |
| 4. ANS: A | PTS: 1 |
| 5. ANS: A | PTS: 1 |
| 6. ANS: C | PTS: 1 |
| 7. ANS: B | PTS: 1 |
| 8. ANS: D | PTS: 1 |
| 9. ANS: D | PTS: 1 |
| 10. ANS: C | PTS: 1 |
| 11. ANS: C | PTS: 1 |
| 12. ANS: B | PTS: 1 |
| 13. ANS: C | PTS: 1 |
| 14. ANS: A | PTS: 1 |
| 15. ANS: B | PTS: 1 |
| 16. ANS: C | PTS: 1 |
| 17. ANS: B | PTS: 1 |
| 18. ANS: A | PTS: 1 |
| 19. ANS: A | PTS: 1 |
| 20. ANS: C | PTS: 1 |
| 21. ANS: B | PTS: 1 |
| 22. ANS: D | PTS: 1 |
| 23. ANS: C | PTS: 1 |
| 24. ANS: A | PTS: 1 |
| 25. ANS: B | PTS: 1 |
| 26. ANS: D | PTS: 1 |
| 27. ANS: B | PTS: 1 |
| 28. ANS: C | PTS: 1 |
| 29. ANS: C | PTS: 1 |
| 30. ANS: C | PTS: 1 |
| 31. ANS: D | PTS: 1 |
| 32. ANS: D | PTS: 1 |
| 33. ANS: C | PTS: 1 |
| 34. ANS: B | PTS: 1 |
| 35. ANS: C | PTS: 1 |
| 36. ANS: D | PTS: 1 |
| 37. ANS: C | PTS: 1 |
| 38. ANS: C | PTS: 1 |
| 39. ANS: A | PTS: 1 |
| 40. ANS: B | PTS: 1 |


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