Answer Key

1. A. bb
   B. b and/or b
2. Bb
3. A. B
   B. b
   C. b
   D. Bb
   E. bb
   F. b
   G. Bb
   H. bb
4. Incomplete Dominance
5. The gene that codes for hemoglobin (sickle cell anemia)
6. Malaria
7. A. Ss
   B. The three with the genotype "Ss"
8. Multiple Alleles
9. I^AI^A, I^Ai, I^BI^B, I^Bi, I^AI^B, or ii (could also put AA, AO, BB, BO, AB, and OO)
10. A. AA or AO
    B. BB or BO
11. The X-chromosome
12. Sex-Linked

13. Deoxyribonucleic Acid

14. Double helix, James Watson and Francis Crick (Rosalind Franklin is also acceptable)

15. Adenine, Guanine, Cytosine, Thymine

16. Thymine, 2 hydrogen bonds

17. Guanine, 3 hydrogen bonds

18. Phosphate, covalent

19. Centromere

20. Histone proteins, it wraps around it twice

21. Explanation should include the terms specified, points given vary upon the depth of the depth of the explanation and if the information is correct.

Sample Explanation: A portion of the double helix is unwound by a helicase.

A molecule of a DNA polymerase binds to one strand of the DNA and begins moving along it in the 3' to 5' direction, using it as a template for assembling a leading strand of nucleotides and reforming a double helix. In eukaryotes, this molecule is called DNA polymerase delta (δ).

Because DNA synthesis can only occur 5' to 3', a molecule of a second type of DNA polymerase (epsilon, ε, in eukaryotes) binds to the other template strand as the double helix opens. This molecule must synthesize discontinuous segments of polynucleotides (called Okazaki fragments). Another enzyme, DNA ligase I then stitches these together into the lagging strand.

22. Points given vary upon the depth of the

depth of the explanation and if the information is correct.

Sample Explanation: The DNA double helix unwinds and the two strands separate. Free RNA nucleotides are assembled using ONE of the two DNA strands as the template. The RNA nucleotides link up to form a strand of RNA. The RNA separates from the DNA. The DNA double helix reforms. The enzyme RNA polymerase is responsible for stages 1 to 3.

The RNA produced as a result of transcription carries the information needed for making a polypeptide out into the cytoplasm, so it is called a messenger RNA (mRNA).

23. Ribonucleic acid, 1. Deoxyribose vs. ribose 2. Single strand vs. double strand 3. Thymine vs. Uracil

24. mRNA

25. codon; AUG

26. cytoplasm of the cell

27. Points given vary upon the depth of the

depth of the explanation and if the information is correct.

Sample Explanation: Messenger RNA (mRNA) carries DNA's genetic information to the ribosome, where it is translated into a sequence of amino acids. mRNA is fed into the ribosome, and it is positioned so that it can be read in groups of three letters, known as codons. Each mRNA codon is matched against the transfer RNA molecule's anti-codon. If there is a match, the amino acid carried by the transfer RNA is added to the growing protein chain.

28. **Point** -Point mutations are those that occur at a specific site along the DNA molecule, specifically a change in a single nucleotide. One type of point mutation is base substitution, during which one base along the original DNA sequence is replaced by another base.

    Frame shift- The entire sequence is shifted one or more frames along the DNA sequence. Two types of mutations that cause a frame shift mutation are insertion (a base is added into the original DNA sequence) and deletion (a base is deleted from the original DNA sequence.).

29. B
30. E
31. C
32. A
33. B
34. B (Keep in mind that the END codon does not actually code for an amino acid)
35. B
36. A
37. DNA Polymerase (1)
38. DNA Ligase
39. RNA primers
40. DNA primase
41. Okazaki Fragments
42. DNA polymerase (3)
43. Helicase
44. SSB (Single Strand Binding proteins

45. Topoisomerase
46. Amino acids
47. Covalent bond, or chain of amino acids
48. Ribosome (large subunit)
49. tRNA
50. mRNA
51. DNA molecule
52. Histone protein
53. Nucleosome
54. Chromatid
55. Chromosome
56. James Watson and Francis Crick