Practice DNA Replication, Protein Synthesis, Meiosis and Mitosis

Name: ___________________________  Date: ________________

1. Which nucleotide contains a nitrogenous base that pairs with thymine in double-stranded DNA?

A. 1  B. 2  C. 3  D. 4

2. Select the type of nucleic acid, chosen from the list below, that is best described by the statement shown.

Carries amino acids to cell organelles known as ribosomes

A. Deoxyribonucleic acid
B. Messenger ribonucleic acid
C. Ribosomal ribonucleic acid
D. Transfer ribonucleic acid

3. Which components of DNA are held together by weak hydrogen bonds?

A. phosphate and adenine
B. phosphate and deoxyribose
C. thymine and deoxyribose
D. cytosine and guanine

4. At which point would hydrogen bonding between two nitrogenous bases normally occur?

A. A  B. B  C. C  D. D

5. Select the type of nucleic acid, chosen from the list below, that is best described by the statement shown.

Carries information from the nucleus of a cell to its cytoplasm

A. Deoxyribonucleic acid
B. Messenger ribonucleic acid
C. Ribosomal ribonucleic acid
D. Transfer ribonucleic acid
6. The symbols shown illustrate components of nucleic acids. Which combination represents a single nucleotide?

\[ \text{A. } 1,2,4 \quad \text{B. } 2,3,4 \quad \text{C. } 1,6,7 \quad \text{D. } 4,5,7 \]

7. Select the nucleic acid molecules, *chosen from the list below*, that is best described by the statement shown.

May contain the genetic codon symbolized by UCG

A. DNA molecules, only
B. RNA molecules, only
C. Both DNA and RNA molecules

8. Select the nucleic acid molecules, *chosen from the list below*, that is best described by the statement shown.

May contain the compound adenine

A. DNA molecules, only
B. RNA molecules, only
C. Both DNA and RNA molecules

9. Select the nucleic acid molecules, *chosen from the list below*, that is best described by the statement shown.

Composed of nitrogenous bases, sugar molecules, and phosphate units.

A. DNA molecules, only
B. RNA molecules, only
C. Both DNA and RNA molecules

10. Which event takes place first during DNA replication?

A. A single-stranded RNA molecule is formed
B. Transfer RNA links to an amino acid.
C. Free nucleotides are bonded together in the correct sequence.
D. The DNA molecule “unzips” along weak hydrogen bonds.

11. Which illustration of a chromosomal change best represents a chromosome mutation known as a deletion?

A. \[ \text{ABCDEFG} \rightarrow \text{ABCDEF} \]
B. \[ \text{ABCDEFG} \rightarrow \text{ABCDEFGH} \]
C. \[ \text{ABCDEFG} \rightarrow \text{ABCDEFG} \]
D. \[ \text{ABCDEFG} \rightarrow \text{ABCDEFGKMN} \]
12. If one strand of DNA molecule has the base sequence A-G-C-T-A, the complementary strand of DNA would have the base sequence

A. A-G-C-T-A  
B. U-C-G-A-T  
C. U-C-G-A-U  
D. T-C-G-A-T

13. If strand A represents a portion of a DNA molecule, its complementary sequence of nitrogenous bases on messenger RNA would normally be

B. T-C-T-A-G-T-C-T  
D. U-G-U-A-G-U-C-U

14. Strand A would normally be found in the

A. plasma membrane  
B. ribosome  
C. vacuole  
D. nucleus

15. Which process takes place before mitosis occurs in a cell containing this DNA?

A. Hydrogen bonds at 6 break and one double-stranded DNA molecule results.  
B. Hydrogen bonds at 5 break and two double-stranded DNA molecules are synthesized.  
C. Covalent bonds at 2 and 6 break and one double-stranded DNA molecule results.  
D. Covalent bonds at 4 break and two double-stranded DNA molecules are synthesized.

16. The base sequence of strand II is most likely

A. C-A-C-T-G-G  
B. G-G-T-C-A-C  
C. G-T-G-A-C-C  
D. G-T-G-U-C-C
17. A portion of a DNA molecule is represented by

A. 1  B. 2  C. 3  D. 4

18. A portion of a messenger RNA molecule is represented by

A. 1  B. 2  C. 3  D. 4

19. The messenger RNA codon for methionin is

A. TAC  B. UAC  C. ATG  D. AUG

20. The process represented in the diagram occurs on the cell organelle known as a

A. vacuole  B. ribosome  C. chloroplast  D. mitochondrion

21. The process represented in the diagram is

A. lipid digestion  B. cell respiration  C. protein synthesis  D. protein hydrolysis

22. The sequence of nitrogen bases on a portion of a strand of DNA is A-T-G-C-A-A. Which sequence best represents the portion of the messenger RNA strand that encodes this information?

23. What will happen if a base sequence of a strand of DNA is changed from A–T–G to A–T–C?

A. The m–RNA will be changed from U–A–C to U–A–G.
B. The t–RNA will be changed from U–A–C to T–A–C.
C. The m–RNA will be changed from T–U–C to T–U–G.
D. The t–RNA will be changed from C–A–U to C–A–C.

24. In nucleotides, the letter A, G, C, and T represents

A. phosphate groups  B. deoxyribose sugars
C. nitrogenous bases  D. ribose sugars

25. The diagram represents molecules involved in protein synthesis.

In plant cells, molecule 1 is found in the

A. centriole  B. nucleus
C. cell wall  D. lysosome

26. Messenger RNA (mRNA) Codes for Selected Amino Acids

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<th>Amino Acid</th>
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<tr>
<td>Leucine</td>
<td>C–C–A</td>
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<tr>
<td>Arginine</td>
<td>C–G–A</td>
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<tr>
<td>Phenylalanine</td>
<td>U–U–U</td>
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<tr>
<td>Valine</td>
<td>G–U–U</td>
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<tr>
<td>Lysine</td>
<td>A–A–A</td>
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</table>

Which base sequence of a DNA molecule produces a codon on an mRNA molecule that will allow the amino acid arginine to be incorporated into a protein?

A. C–G–A  B. G–C–T
C. C–G–U  D. G–C–U
27. Which amino acid will be carried to a ribosome by a transfer RNA molecule containing the triplet code A–A–A?

A. valine B. lysine
C. leucine D. phenylalanine

28. Some events that take place during the synthesis of a specific protein are listed.

A) Messenger RNA attaches to a ribosome.
B) DNA serves as a template for RNA production.
C) Transfer RNA bonds to a specific codon.
D) Amino acids are bonded together.
E) RNA moves from the nucleus to the cytoplasm.

The correct order of these events is

A. B → E → A → C → D
B. D → A → E → C → B
C. B → C → E → D → A
D. C → B → A → E → D

29. In a fruit fly in which the diploid number of chromosomes is 8, the chromosome number in each gamete is normally

A. 16 B. 2 C. 8 D. 4

30. The process by which homologous chromosomes exchange segments of DNA is

A. segregation
B. crossing-over
C. fertilization
D. independent assortment

31. What is the normal number of chromosomes in a human zygote?

A. 23 B. 24 C. 46 D. 48

32. The gamete produced in the ovary of an animal is the

A. egg cell B. sperm cell
C. spore D. zygote

33. Select the nucleic acid molecules, chosen from the list below, that is best described by the statement shown.

May transport amino acids

A. DNA molecules, only
B. RNA molecules, only
C. Both DNA and RNA molecules
34. Nondisjunction of the sex chromosomes of a human female during meiosis may result in her daughter inheriting a condition represented by

A. YY  B. XXX  C. XY  D. XYY

35. Occasionally during meiosis, a single homologous chromosome pair may fail to separate. A human gamete produced by such a nondisjunction would have a chromosome number of

A. 23  B. 24  C. 25  D. 26

36. In the diagram shown, in which structure would homologous pairs of chromosomes normally be present?

A. 1, only  B. 2, only  
C. 3, only  D. either 1 or 2

37. The diagram shown represents a cell that will undergo mitosis. Which diagrams below best illustrate the nuclei of the daughter cells that result from a normal mitotic cell division of the parent cell shown?

A.  
B.  
C.  
D.  

38. The failure of homologous chromosomes to separate from each other is known as

A. crossing-over  B. disjunction  
C. nondisjunction  D. synopsis
39. Which statement most accurately compares mitotic cell division in plant and animal cells?

A. It is exactly the same in plant and animal cells.
B. The walls of plant cells pinch in, but the membranes of animal cells do not.
C. Most plant cells use centrioles, but most animal cells do not.
D. In both plants and animals, the daughter cells are genetically identical to the original cell.

40. A diploid cell of a normal human male contains

A. 22 autosomes and two Y-chromosomes
B. 22 pairs of autosomes and two Y-chromosomes
C. 22 pairs of autosomes, one X-chromosome, and one Y-chromosome
D. 22 autosomes and two X-chromosomes

41. The horse, *Equus caballus*, has 64 chromosomes in its body cells. The donkeys, *Equus asinus*, has 62. How many chromosomes would most likely be found in the body cells of a hybrid mule resulting from a mating of these two animals?

A. 126  B. 95  C. 63  D. 32

42. The normal diploid chromosome number of the house mouse, *Mus musculus*, is 40. How many pairs of homologous chromosomes would a normal zygote of *Mus musculus* contain?

A. 10  B. 20  C. 40  D. 80

43. Which diagram represents a sperm that can unite with a normal egg to produce a zygote that will develop into a normal human male embryo?

A. ![Diagram A](22+XY)  B. ![Diagram B](22+Y)
C. ![Diagram C](44+XY)  D. ![Diagram D](22+X)
44. The distribution of chromosomes in one type of cell division is shown in the diagram below.

Which process is represented in the diagram?

A. asexual reproduction  
B. meiosis  
C. mitosis  
D. vegetative propagation

45. If the diploid chromosome number of a cloned plant is 12, the chromosome number of the plant cell used to produce the cloned plant is

A. 3  
B. 6  
C. 12  
D. 24

46. The diploid chromosome number in a certain species of fish is 20. How many chromosomes would normally be found in bone cell of this fish?

A. 10  
B. 20  
C. 23  
D. 40

47. The diagram shown represents a microscopic structure observed during the process of cell division. Letter A indicates a

A. nucleolus  
B. ribosome  
C. centriole  
D. centromere

48. The diagram shown represents a microscopic structure observed during the process of cell division. Letter B indicates a

A. centrosome  
B. spindle fiber  
C. chromatid  
D. cell plate

49. Uncontrolled cell division is characteristic of

A. cancer  
B. meiosis  
C. budding  
D. sporulation
50. Sometimes a section of a chromosome is lost during meiosis. This loss results in a change in genetic material known as

A. a deletion    B. replication
C. crossing-over  D. polyploidy

51. Which statement best describes a difference between cell division in plant and animal cells?

A. In animal cells, cytoplasmic division is accomplished by “pinching in” of the cell membrane, while in plant cells a cell plate is synthesized.
B. In plant cells, cytoplasmic division is accomplished by a “pinching in” of the cell membrane, while in animal cells a cell plate is synthesized.
C. In plant cells, centrosomes have a distinct role in spindle formation, while in animal cells centrosomes do not function during cell division.
D. In animal cells, replication of chromosomes occurs during the nondividing phase, while in plant cells replication occurs when the nuclear membrane disintegrates.

52. New cells are produced within bone marrow as a direct result of

A. gamete formation    B. meiotic cell division
C. polar body formation  D. mitotic cell division

53. All types of asexual reproduction involve the process known as

A. mitosis    B. fertilization
C. artificial pollination  D. reduction division

54. Normal mitotic cell division results in each daughter cell having

A. half the number of chromosomes as the parent cell
B. the same number and kinds of chromosomes as the parent cell
C. the same number but different kinds of chromosomes as the parent cell
D. twice the number of chromosomes as the parent cell

55. Which is the correct sequence for the stages of mitotic cell division represented by the diagrams shown?

A. A → B → C → D     B. A → C → D → B
C. B → A → D → C     D. B → C → D → A

A  B  C  D
56. Which diagram best represents mitotic cell division?

A. 

B. 

C. 

D. 

57. The diagram shown represents a pair of chromosomes. Which diagram best represents the chromatids if only crossing-over has occurred?

A. 

B. 

C. 

D. 
58. The cell in the diagram below illustrates a stage of mitotic cell division.

Letter B indicates the

A. paired chromosomes  
B. centrioles  
C. cell plate  
D. endoplasmic reticulum

59. A photomicrograph of cells involved in various stages of nuclear division is shown.

Which title is most appropriate for this photomicrograph?

A. Mitosis in an Onion Root Tip  
B. Cell Division in Human Blood Cells  
C. Meiosis in Male Gametes  
D. Gametogenesis in Yeast Cells

60. The process of mitosis usually involves

A. chromosome duplication and synapsis  
B. DNA replication and separation of chromatids  
C. tetrad formation and fertilization  
D. reduction in chromosome number and formation of cell plate
61. The diagrams shown represent stages of a cellular process. Which is the correct sequence of these stages?

A. A → B → C → D  B. B → D → C → A  
C. C → B → D → A  D. D → B → A → C

62. In the diagrams of mitotic cell division shown, which structure is present in diagram B but not in diagram A?

A. centriole  B. cell plate  
C. cell membrane  D. cytoplasm

63. Which diagram most correctly represents the process of mitosis?

A.  
B.  
C.  
D.  

64. With respect to normal base pairing, when a molecule of DNA replicates, thymine will most likely pair with

A. adenine  B. cytosine  
C. guanine  D. uracil

65. During replication, the strands of a double-stranded DNA molecule separate from each other when bonds are broken between their

A. nitrogenous bases  B. 5-carbon sugar  
C. phosphate groups  D. amino acids

66. Cosmic rays, X-rays, ultraviolet rays, and radiation from radioactive substances may function as

A. pollinating agents  B. mutagenic agents  
C. plant auxins  D. animal pigments

67. A change in the normal nitrogenous base sequence of a DNA molecule is known as a

A. gene mutation  B. nondisjunction  
C. hybridization  D. segregation
68. Which statement best describes the process illustrated in the diagram shown?

![Diagram showing chromosome replication and segregation.]

A. Nondisjunction occurs during segregation, resulting in a chromosomal mutation.
B. Crossing-over occurs during synapsis, leading to increased variation.
C. Exposure to mutagenic agents causes gene linkage in nonhomologous chromosomes.
D. Inbreeding causes random breakage and recombination of chromosome parts.

69. The chromosome number of a cell produced by mitotic cell division is represented by $2n$. If that cell had been produced by meiotic cell division, its chromosome number would be represented by

A. $\frac{n}{2}$  
B. $n$  
C. $2n$  
D. $4n$

70. One primary sex cell undergoing the process of oogenesis typically results in the production of

A. three eggs and polar bodies
B. one egg and polar bodies
C. four sperm cells
D. one diploid ovum

71. Which illustration represents a process that results in the production of gametes?

A. ![Diagram of meiotic cell division.]
B. ![Diagram of mitotic cell division.]
C. ![Diagram of genetic recombination.]
D. ![Diagram of chromosome segregation.]

72. The transfer of a section of one chromosome to a nonhomologous chromosome is known as

A. synapsis  
B. deletion  
C. translocation  
D. disjunction
73. Which term refers to the orderly series of events that distributes one chromosome from each pair of homologous chromosomes in a primary sex cell to the nucleus of a gamete?

A. mitotic cell division
B. meiotic cell division
C. fission
D. deletion

74. A human male will normally transmit the genes on his X-chromosome to

A. his sons, only
B. his daughters, only
C. all of his sons and daughters
D. half of his sons and half of his daughters

75. The extra chromosome found in the cells of humans with Down’s syndrome is the result of

A. failure of the developing embryo to undergo meiotic cell division
B. failure of the chromatids to replicate between mitotic cell divisions
C. nondisjunction during meiotic cell division in the gonads of a parent
D. nondisjunction during mitotic cell division in the muscle cells of a parent
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