Student Name _____

Teacher Name _____

School _____

System _____

BIOLOGY I

Item Sampler

Tennessee End of Course Assessment
Biology I Form 5

Reporting Category 5: Heredity

PEARSON

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Introduction to Biology I

Content of tests

The testing program titled the *Tennessee End of Course Assessment* was established to meet the Tennessee mandate for end of course assessments in Tennessee secondary schools. These tests measure the Tennessee State Performance Indicators. Subject areas covered by the end of course assessments include Mathematics, Language Arts, History, and Science.

Test development

For the *Tennessee End of Course Assessment*, a staff of writers – composed of both teachers and professional test developers experienced in each of the content areas – researched and wrote the items. Professional editors and content specialists carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately twice as many items as were needed in the final editions of the tests.

After tryout tests were administered, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including particular items and test directions in operational tests.

Test administration

Tennessee End of Course Assessments are given to students as they near the end of courses that are included in the program. Tests may be given midyear for block schedules or near the end of the school year.

You will have ample time to read and answer each of the questions. The Biology I test has been designed to be administered in one session and is not timed.

Tips for Taking the Test

Preparing for the test

- Review this Tennessee End of Course Item Sampler for Biology I carefully and thoroughly.
- Acquire the Tennessee End of Course Practice Test for Biology I, and take the test several times.
- Become familiar with the correct way to mark answers on the answer sheet.

Before the test

- Get a good night's sleep. To do your best, you need to be rested.

During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. First answer all questions that you are sure about.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Directions for Using the Item Sampler

This Item Sampler for Biology I provides specific information to students and teachers. It contains examples of different item types for each Performance Indicator that may be tested in any given end of course test administration. Performance Indicators have been grouped by Reporting Categories. These Reporting Categories will be used to report information regarding performance on the end of courts test to students, teachers, schools, and systems.

The items in this Item Sampler will not be found in the end of course tests. The number of items in this Item Sampler does not reflect the emphasis of content on the test. In order to identify the emphasis of content, the End of Course Assessment Practice Test for Biology I should be used. The Practice Test gives a better representation of content emphasis across Reporting Categories and Performance Indicators.

An Answer Key is located in Page 39. Use it to check your answers. Review items that you get wrong.

Reporting Category: Heredity

Numbers 1 through 62

Performance Indicator: 3210.4.1 Identify the structure and function of DNA.

1.

Chromosomes in a eukaryotic cell are composed of DNA. What is the main function of DNA?

- **A** provides energy
- **B** directs cellular activity
- **C** transports macromolecules
- **D** provides structural support

Performance Indicator: 3210.4.1 Identify the structure and function of DNA.

2.

Which statement describes the structure of DNA?

- **A** a single strand of amino acids
- **B** a single strand of nucleotides
- **C** a double strand of nucleotides
- **D** a double strand of amino acids

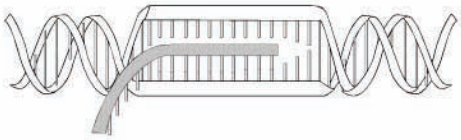
Go On ▶

Performance Indicator: 3210.4.1 Identify the structure and function of DNA.

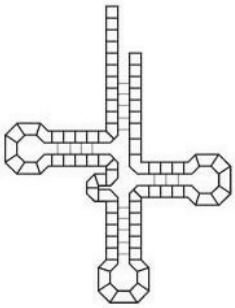
3. **DNA is the information storage molecule of the cell. This information provides the instructions to produce molecules used for cellular activities. Which diagram best illustrates the translation of DNA's encoded instructions?**

○ **A**

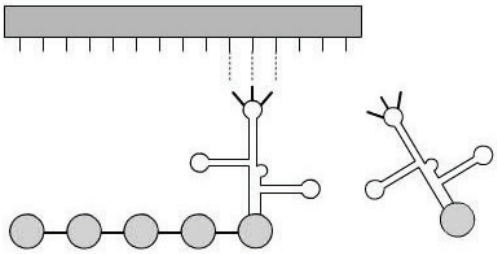
○ **C**



○ **B**

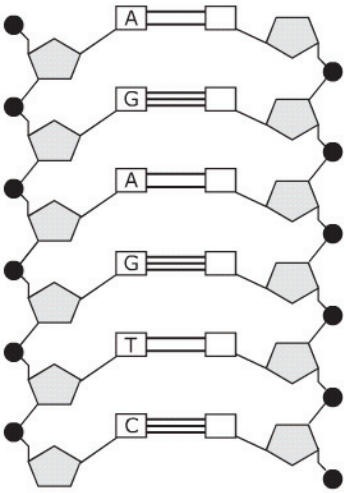


○ **D**



Performance Indicator: 3210.4.1 Identify the structure and function of DNA.

4. **The diagram below shows a representation of a DNA molecule.**



Which sequence of base pairs complements the base pairs on the left side of the DNA molecule?

○ **A** A, G, A, G, T, C

○ **B** T, C, T, C, A, G

○ **C** U, C, T, C, A, G

○ **D** C, T, C, T, C, A

Go On ▶

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

5.

Actinomyocin-D was found to be effective in preventing the growth of rapidly dividing tumor cells by blocking DNA replication. Scientists discovered actinomycin-D also caused side effects like hair loss and a decrease in the number of red blood cells. Which statement best explains the reason that actinomyocin-D caused the side effects?

- **A** Actinomyocin-D alters the environment so that hair and red blood cells are killed.
- **B** Actinomyocin-D affects all cell division, so healthy cells are also unable to divide.
- **C** Actinomyocin-D targets tumor cells, and the side effects are due to the release of chemicals from the tumor cells.
- **D** Actinomyocin-D kills the cells that support the hair cells and red blood cells leading to the death of these cells.

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

6.

Growth rate, length of bones, muscle structure, and hormone levels may all affect human height. Each of these factors is controlled by many different proteins in body cells. What type of gene relationship controls human body height?

- **A** polygenic
- **B** dominant
- **C** codominant
- **D** incompletely dominant

Go On ▶

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

7.

DNA is replicated during the cell cycle. Which event is needed to ensure that the normal number of chromosomes is present in both daughter cells?

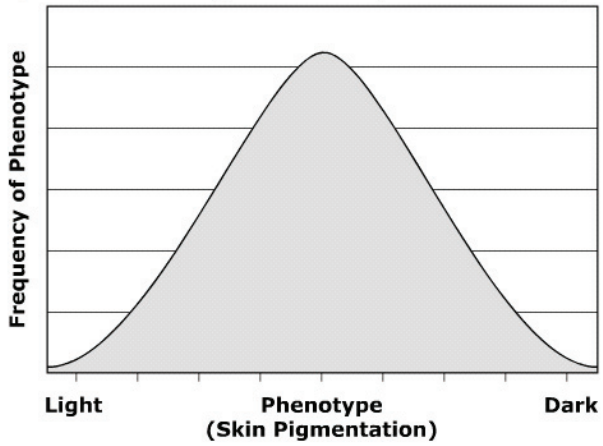
- **A** G_1 phase
- **B** G_2 phase
- **C** mitosis
- **D** cytokinesis

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

8.

The graph below shows the frequency of skin pigmentation expressed in a human population.

Frequency of Skin Pigmentation Expression in a Population



Which statement <u>best</u> describes the distribution of skin pigmentation expression in this population?

- **A** A single sex-linked gene controls skin color expression.
- **B** Multiple genes acting together control skin color expression.
- **C** Some individuals express more skin color variation than others.
- **D** Skin color results from the environment rather than from gene expression.

Go On ▶

Performance Indicator: 3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.

9. **DNA transcribes the information for protein synthesis in mRNA. Where does transcription take place?**

- **A** in the nucleus
- **B** in the cytoplasm
- **C** attached to ribosomes
- **D** bound to amino acids on tRNA

Performance Indicator: 3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.

10. **RNA polymerase facilitates transcription of the genetic information in the DNA molecule into mRNA for protein synthesis. What part of the DNA molecule codes for proteins?**

- **A** a phosphate group
- **B** a specific base pair
- **C** a five-carbon sugar
- **D** a nucleotide sequence

Performance Indicator: 3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.

11. **Proteins are produced during translation. Which molecule carries the protein code that is translated?**

- **A** DNA
- **B** mRNA
- **C** rRNA
- **D** tRNA

Performance Indicator: 3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

12. **Hemophilia is a sex-linked genetic disease. If a male with hemophilia and a homozygous normal female have a female child, what is the probability that the child will be a carrier for hemophilia?**

- **A** 0%
- **B** 25%
- **C** 50%
- **D** 100%

Performance Indicator: 3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

13. **In humans, the allele for having a straight thumb is dominant to the allele for having a curved thumb. A male is homozygous dominant for straight thumbs, and a female has curved thumbs. What is the probability that their offspring has curved thumbs?**

- **A** 0%
- **B** 25%
- **C** 50%
- **D** 100%

Performance Indicator: 3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

14. **In snapdragons, if white flowers are crossed with red flowers, all the offspring have pink flowers. When two pink snapdragons are crossed, some offspring have white flowers, some have red flowers, and some have pink flowers. Which inheritance pattern do snapdragon flowers exhibit?**

- **A** sex-linked trait
- **B** polygenic trait
- **C** incomplete dominance
- **D** codominance

Performance Indicator: 3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

15. **Baldness is the loss of human hair on the head and is a recessive sex-linked trait. A male with the recessive genotype and a female heterozygous for the genotype have children. What is the probability that a female child will inherit the baldness trait?**

- **A** 0%
- **B** 25%
- **C** 50%
- **D** 100%

Performance Indicator: 3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

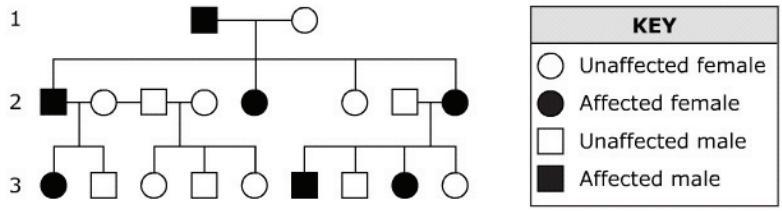
16. **The gene for flower color in some plants displays incomplete dominance. In one plant species, the genotypes (RR) yield red petals, (rr) yield white petals, and (Rr) yield pink flowers. What is the probability a cross between two plants heterozygous for flower color produce pink-flowering offspring?**

- **A** 25%
- **B** 50%
- **C** 75%
- **D** 100%

Go On ▶

Performance Indicator: 3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

17. **The pedigree below shows the inheritance of a trait in humans.**

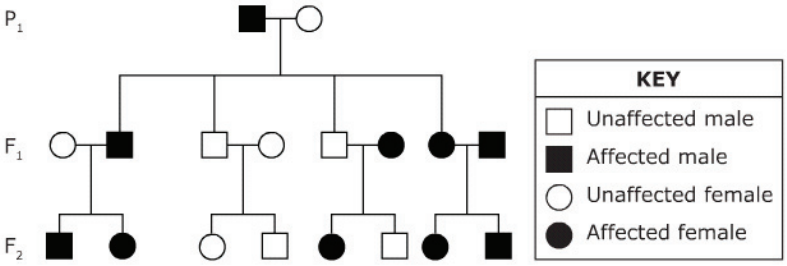


What pattern of inheritance is shown in this pedigree?

- **A** polygenic
- **B** codominance
- **C** simple dominance
- **D** recessive sex-linked

Performance Indicator: 3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

18. **The pedigree chart below shows the transmission of a genetic trait over several generations.**

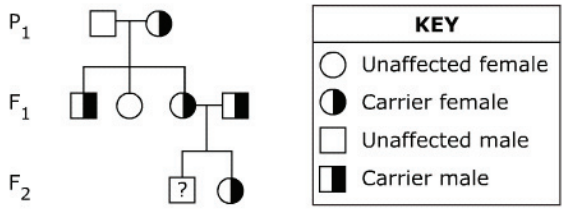


What type of inheritance pattern does the pedigree display?

- **A** autosomal dominant
- **B** autosomal recessive
- **C** sex-linked dominant
- **D** sex-linked recessive

Performance Indicator: 3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

19. **The illustration below shows a pedigree with an autosomal recessive mutation.**

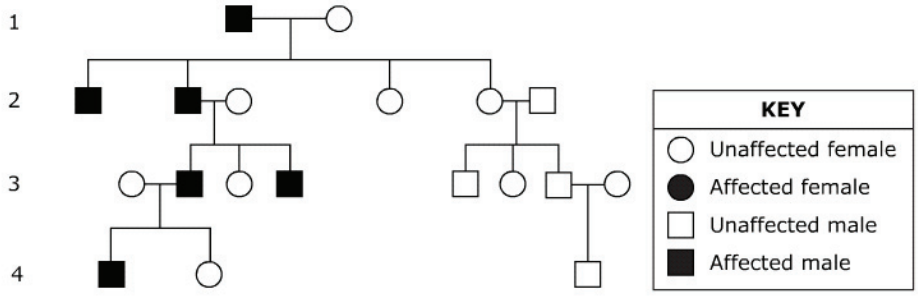


What is the possibility that the male in the F_2 generation will express the mutation?

- **A** 25%
- **B** 50%
- **C** 75%
- **D** 100%

Performance Indicator: 3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

20. **The pedigree chart below shows the transmission of a genetic trait over several generations.**

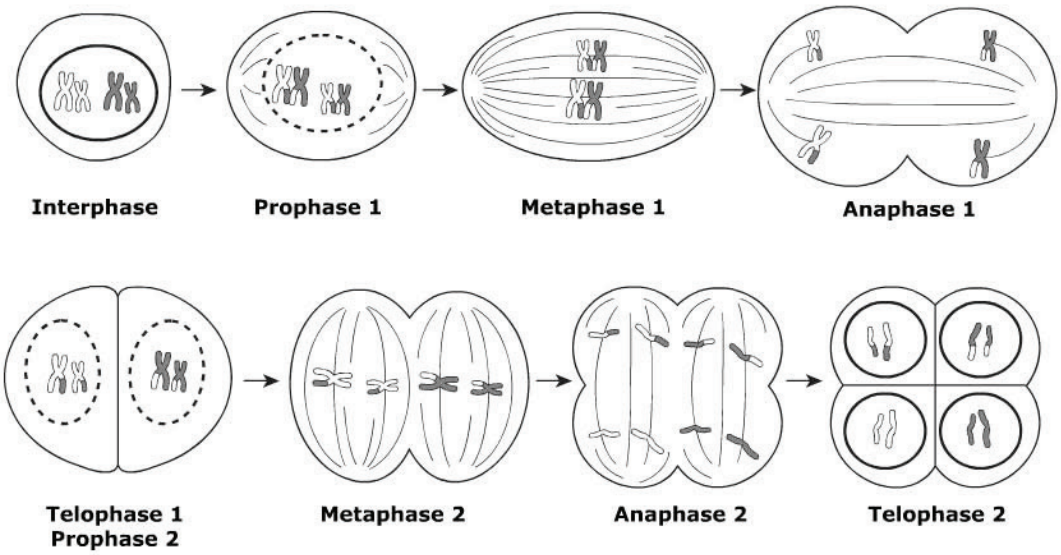


Which statement provides the <u>most</u> support that the trait is a sex-linked trait on the Y chromosome?

- **A** The trait shows up only in males.
- **B** The trait is passed to females.
- **C** The trait is present in all generations.
- **D** The trait shows up in all sons of affected males.

Performance Indicator: 3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.

21. **The diagram shows the stages of meiosis.**



What process results in egg cells with genetic compositions that are different than the female parent?

- **A** Replication of chromosomes during interphase prior to meiosis.
- **B** Realignment of chromosomes during metaphase II.
- **C** Crossing over of chromosomes during prophase I.
- **D** Separation of chromosomes during anaphase I.

Performance Indicator: 3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.

22. **Gametes contain half the number of chromosomes that other cells in the body contain. When are gametes produced in organisms?**

- **A** during meiosis
- **B** during mitosis
- **C** during replication
- **D** during transcription

Performance Indicator: 3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.

23. **Why is meiosis important for sexual reproduction?**

- **A** Meiosis increases the number of body cells.
- **B** Meiosis reduces the number of chromosomes.
- **C** Meiosis reduces the chance of genetic variation.
- **D** Meiosis increases the chance of desirable mutations.

Performance Indicator: 3210.4.7 Describe how meiosis and sexual reproduction contribute to genetic variation in a population.

24. **A researcher demonstrates that fish species in a freshwater aquatic environment show genetic variation in each generation. Which property in fish species explains this variation?**

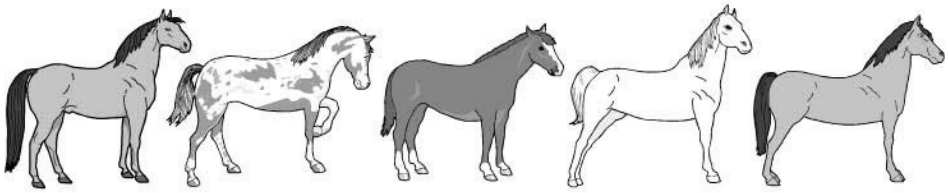
- **A** Their body cells divide by mitosis.
- **B** Their structure includes multiple cells.
- **C** Their reproductive cells perform meiosis.
- **D** Their cells include multiple chromosomes.

Go On ▶

Performance Indicator: 3210.4.7 Describe how meiosis and sexual reproduction contribute to genetic variation in a population.

25.

Below is a picture of five horses from a herd of wild horses in Wyoming. Large populations of animals that reproduce sexually display different characteristics.



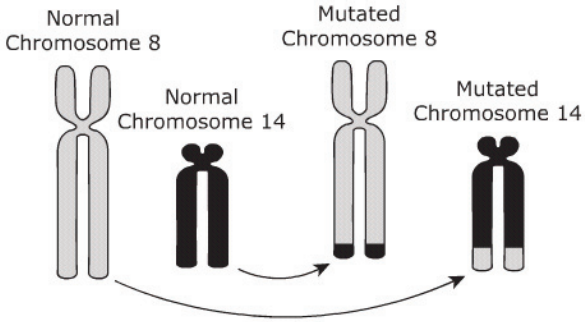
Which statement best explains the differences in the appearance of the horses in this population?

- **A** Different characteristics are due to the egg and sperm each having two recessive genes.
- **B** Different traits come from independent assortment of chromosomes in gamete formation.
- **C** The traits carried by the male parent are dominant over the traits carried by the female parent.
- **D** Genes in each generation of a population mutate and create different physical characteristics.

Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

26.

Chronic myeloid leukemia is caused by a chromosomal mutation. An example of this mutation is shown in the diagram below.

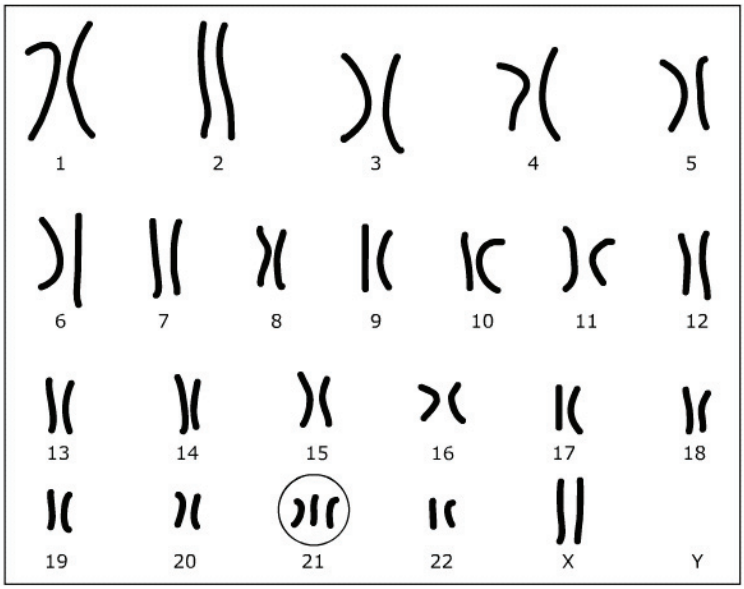


What type of mutation causes chronic myeloid leukemia?

- **A** deletion
- **B** duplication
- **C** inversion
- **D** translocation

Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

27. **A human karyotype highlighting chromosome 21 is shown in the diagram below.**

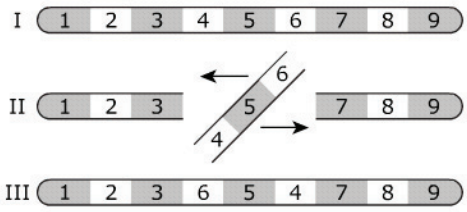


Which process is attributed to causing an additional 21st chromosome in this human karyotype?

- **A** duplication
- **B** monosomy
- **C** nondisjunction
- **D** translocation

Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

28. **Genetic disorders can be caused by changes in chromosome structures. A type of change in chromosome structure is shown in the diagram.**



This diagram displays what type of chromosomal change?

- **A** deletion
- **B** duplication
- **C** inversion
- **D** translocation

Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

29. **Why does an inversion mutation on a chromosome in an egg cell tend to cause more severe genetic disorders than a point mutation in a gene in an egg cell?**

- **A** The point mutation of a single gene to produce a new protein is not possible.
- **B** The point mutation of a single gene to produce a genetic disorder is not possible.
- **C** The inversion mutation can directly alter many traits while the point mutation can directly alter only one.
- **D** The inversion mutation is passed on to daughter cells while the point mutation is repaired during mitosis.

Performance Indicator: 3210.4.9 Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.

30. **Some American farmers are growing crops with seeds that have been genetically modified to release substances toxic to weeds. These modified crops reduce the need to spray crops with weed-killing chemicals. The concern about the use of genetically modified seeds is the chance that the weeds could become resistant to the toxin released by the crops. Scientists have discovered toxin-resistant weeds in areas that are growing genetically modified crops of soybeans and cotton. How might genetically modified crops affect agriculture in the United States?**

- **A** Genetically modified crops could contaminate the soil with toxins.
- **B** Genetically modified crops could cause weeds to become a difficult problem to control.
- **C** Genetically modified crops could increase food prices and cause American farmers to lose money.
- **D** Genetically modified crops could be the future of agriculture, and resistant weeds will be an accepted side effect.

Go On ▶

Performance Indicator: 3210.4.9 Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.

31. **Through scientific research, genetic technologies have advanced the study of gene sequences. Which is a main benefit of gene therapy technology?**

- **A** the ability to cure genetic diseases by replacing defective genes
- **B** the ability to genetically design organisms that have never existed
- **C** understanding how human genes turn on and off to make carbohydrates
- **D** making genetically superior plants and animals to benefit the entire world

Performance Indicator: 3210.4.1 Identify the structure and function of DNA.

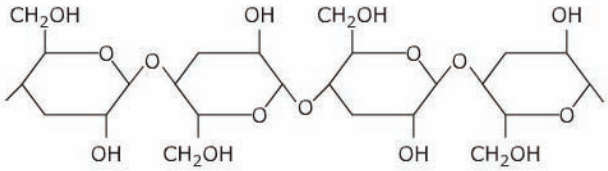
32. **The bases in DNA pair by chemical interactions. How are the base pairs formed differently between the pairs?**

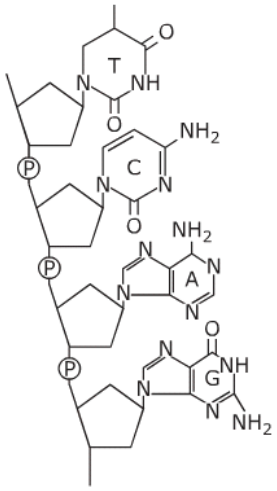
- **A** Adenine and thymine form two hydrogen bonds, while cytosine and guanine form three hydrogen bonds.
- **B** Adenine and thymine form three hydrogen bonds, while cytosine and guanine form two hydrogen bonds.
- **C** Adenine and thymine form covalent bonds, while cytosine and guanine form hydrogen bonds.
- **D** Adenine and thymine form hydrogen bonds, while cytosine and guanine form covalent bonds.

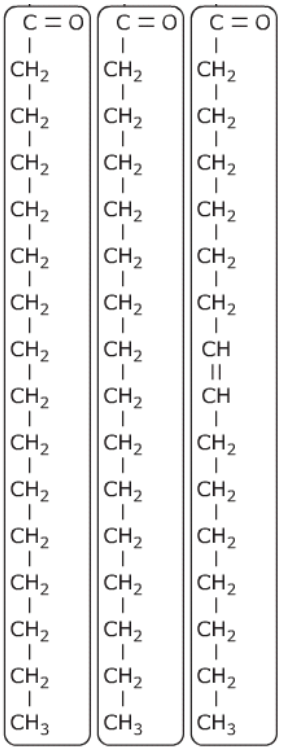
Go On ▶

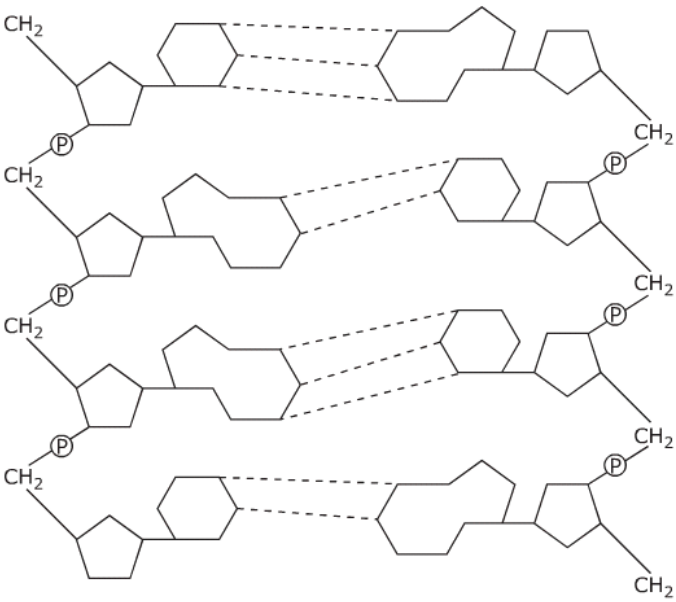
Performance Indicator: 3210.4.1 Identify the structure and function of DNA.

33. **DNA is an example of a macromolecule building block of cells. Which diagram represents the structure of DNA?**

A


C


B


D


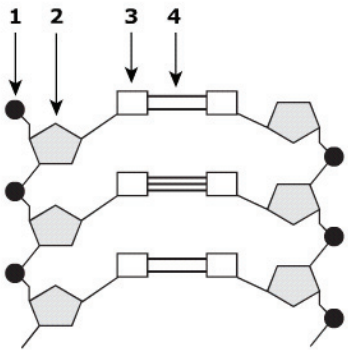
Performance Indicator: 3210.4.1 Identify the structure and function of DNA.

34. **DNA contains four different nitrogenous bases. Which base always pairs with guanine in the DNA molecule?**

- **A** uracil
- **B** cytosine
- **C** adenine
- **D** thymine

Performance Indicator: 3210.4.1 Identify the structure and function of DNA.

35. **DNA contains the genetic information of a cell. A portion of a DNA molecule is shown below.**



Which portion of DNA contains the genetic information?

- **A** 1
- **B** 2
- **C** 3
- **D** 4

Go On ▶

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

36.

Antibiotics are frequently used to treat bacterial infections. Antibiotics function in different ways to interfere with important biological functions in bacteria. The antibiotic nalidixic acid functions to block the enzyme responsible for uncoiling and coiling DNA. How would the action of nalidixic acid allow this chemical to be effective in treating bacterial infections?

- **A** Nalidixic acid causes the cells to divide uncontrollably.
- **B** Nalidixic acid is toxic to the cells and causes the cells to burst.
- **C** Nalidixic acid produces mutations in the DNA and results in cell death.
- **D** Nalidixic acid prevents the production of proteins needed for cell division.

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

37.

Hereditary information is passed from parents to offspring through gametes. Which gene relationship is <u>most</u> likely to result in a portion of offspring that are all recessive males?

- **A** a polygenic trait
- **B** a dominant trait
- **C** a sex-linked trait
- **D** a codominant trait

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

38. **Scientists frequently treat cells with chemicals to produce mutations in DNA to study cellular functions. Which cellular process that carries out the hereditary instructions would be affected by a mutation?**

- **A** photosynthesis
- **B** protein synthesis
- **C** aerobic respiration
- **D** anaerobic respiration

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

39. **A red-flowered plant is crossed with a white-flowered plant. Which offspring phenotype shows that flower color is an incompletely dominant trait in these plants?**

- **A** red flowers
- **B** pink flowers
- **C** white flowers
- **D** orange flowers

Performance Indicator: 3210.4.2 Associate the process of DNA replication with its biological significance.

40. **In eukaryotic cells, DNA replication occurs during interphase. Why is DNA replication important?**

- **A** to provide a method for cytoplasm division
- **B** to increase the chromosome number in cells
- **C** for the transmission of genetic traits from DNA to RNA
- **D** for the equal distribution of genetic material to daughter cells

Performance Indicator: 3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.

41. **A portion of DNA is transcribed into the mRNA sequence AUGUCAAGCGUA. The table below shows the amino acids that correspond to codons in an mRNA sequence.**

First Letter	Second Letter				Third Letter
	U	C	A	G	
U	Phenylalanine	Serine	Tyrosine	Cysteine	U
	Phenylalanine	Serine	Tyrosine	Cysteine	C
	Leucine	Serine	Stop	Stop	A
	Leucine	Serine	Stop	Tryptophan	G
C	Leucine	Proline	Histidine	Arginine	U
	Leucine	Proline	Histidine	Arginine	C
	Leucine	Proline	Glutamine	Arginine	A
	Leucine	Proline	Glutamine	Arginine	G
A	Isoleucine	Threonine	Asparagine	Serine	U
	Isoleucine	Threonine	Asparagine	Serine	C
	Isoleucine	Threonine	Lysine	Arginine	A
	(Start) Methionine	Threonine	Lysine	Arginine	G
G	Valine	Alanine	Aspartate	Glycine	U
	Valine	Alanine	Aspartate	Glycine	C
	Valine	Alanine	Glutamate	Glycine	A
	Valine	Alanine	Glutamate	Glycine	G

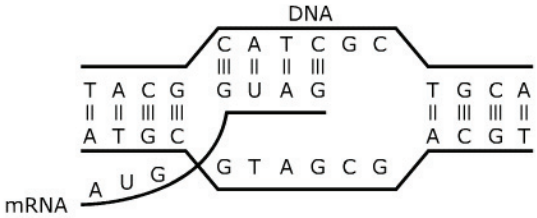
Which chain of amino acids corresponds to the mRNA sequence?

- **A** methionine-serine-serine-valine
- **B** methionine-histidine-proline-asparagine
- **C** isoleucine-phenylalanine-arginine-leucine
- **D** asparagine-arginine-proline-phenylalanine

Go On ▶

Performance Indicator: 3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.

42. **The transcription of a DNA strand is shown in the diagram below.**



What is the purpose of this process?

- **A** replicate chromosomes before cell division
- **B** transfer information for a protein code
- **C** remove mutations in the genetic code
- **D** provide a source of cell energy

Performance Indicator: 3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.

43. **In preparation for protein synthesis, what information is transferred between DNA and mRNA?**

- **A** coding for carbohydrates
- **B** coding for peptide bonds
- **C** coding for amino acids
- **D** coding for lipids

Performance Indicator: 3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

44. **Tall (T) is dominant to short (t) in pea plants. If two heterozygous pea plants (Tt x Tt) are crossed, what percentage of the offspring will be heterozygous?**

- **A** 0%
- **B** 25%
- **C** 50%
- **D** 75%

Performance Indicator: 3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

45. **The table below shows the alleles responsible for blood types in humans.**

Allele	Blood Type
I^A	A
I^B	B
i	O

What is the probability that a man who is heterozygous for blood type B and a woman with blood type AB could have a child with blood type O?

- **A** 0%
- **B** 25%
- **C** 50%
- **D** 100%

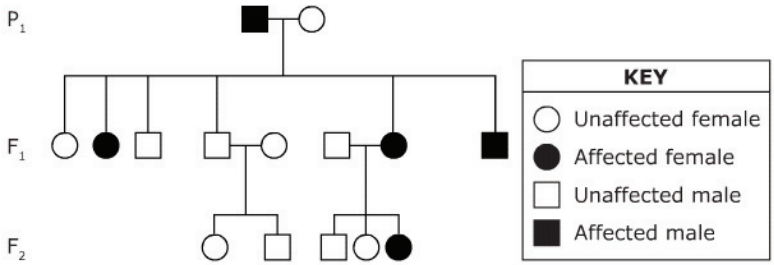
Performance Indicator: 3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

46. **A guinea pig breeder owns a pure-breeding black male (BB) and a pure-breeding white female (bb). What is the probability that offspring from these two guinea pigs will exhibit the black fur phenotype?**

- **A** 25%
- **B** 50%
- **C** 75%
- **D** 100%

Performance Indicator: 3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

47. **The inheritance of a genetic trait is shown in the pedigree below.**

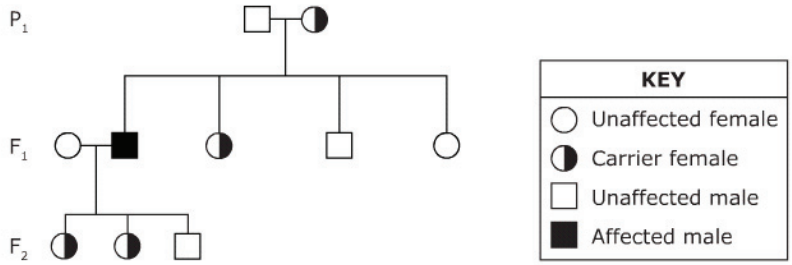


Based on the pedigree, how is the trait inherited?

- **A** sex-linked recessive
- **B** sex-linked dominant
- **C** autosomal recessive
- **D** autosomal dominant

Performance Indicator: 3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

48. **The inheritance of a mutation is shown in the pedigree below.**

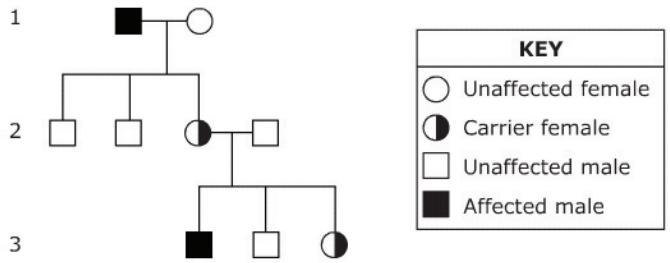


What is the genotype of the male in the F_2 generation?

- **A** X^AX^A
- **B** X^aX^a
- **C** X^AY
- **D** X^aY

Performance Indicator: 3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

49. **The transmission of a genetic disorder is shown in the pedigree below.**

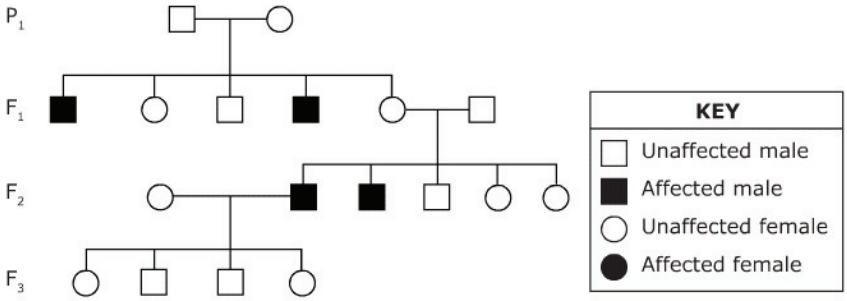


Which statement <u>best</u> describes why this trait is sex-linked?

- **A** The trait is only inherited from a female carrier.
- **B** The trait is absent in the first generation female.
- **C** The trait is expressed only in males and not expressed by females.
- **D** The trait is absent in the second generation males of the parent generation.

Performance Indicator: 3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

50. **The pedigree below shows data of an inherited human trait.**

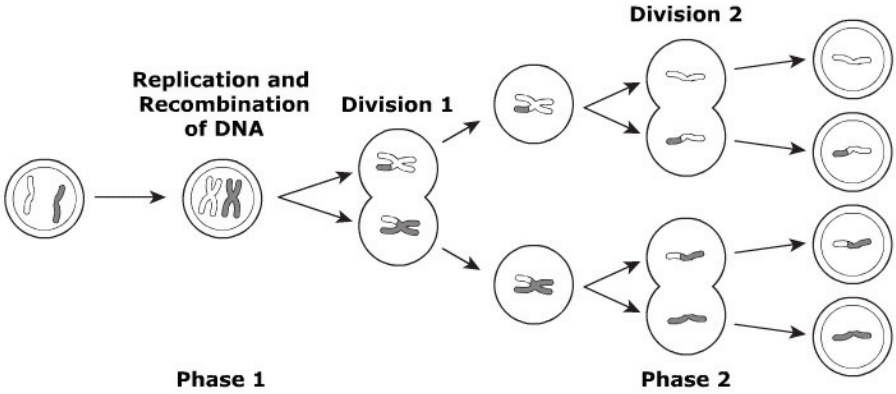


What type of inheritance is displayed in the pedigree?

- **A** autosomal recessive
- **B** simple dominance
- **C** codominant
- **D** sex-linked

Performance Indicator: 3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.

51. **Meiosis produces daughter cells as shown in the diagram.**



What stage produces the haploid condition of the four daughter cells?

- **A** Replication
- **B** Recombination
- **C** Division 1
- **D** Division 2

Go On ▶

Performance Indicator: 3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.

52. **What is the end result of meiosis?**

- **A** two haploid cells
- **B** two diploid cells
- **C** four haploid cells
- **D** four diploid cells

Performance Indicator: 3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.

53. **In what way do the products of meiosis differ from the products of mitosis?**

- **A** Meiosis results in no new cells.
- **B** Meiosis results in egg or sperm cells.
- **C** Meiosis results in two daughter cells.
- **D** Meiosis results in cells identical to the parent cell.

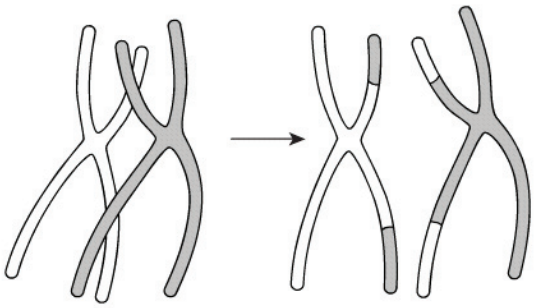
Performance Indicator: 3210.4.7 Describe how meiosis and sexual reproduction contribute to genetic variation in a population.

54. **Which event during meiosis introduces genetic variation between parents and offspring?**

- **A** condensation of the chromatin to form distinct chromosomes
- **B** replication of DNA to make multiple copies of parent genetic material
- **C** crossing over of homologous sequences between matching chromosomes
- **D** migration of chromosomes to opposite sides of the cell along microtubules

Performance Indicator: 3210.4.7 Describe how meiosis and sexual reproduction contribute to genetic variation in a population.

55. **A diagram of crossing over, which occurs during prophase I of meiosis, is shown.**



What is the genetic significance of crossing over during meiosis?

- **A** Chromosomal exchange of genetic material greatly increases genetic variation.
- **B** Only two of the four gamete cells produced will contain identical chromosomes.
- **C** The chances of daughter cells receiving abnormal chromosome numbers increase.
- **D** Chromosomes that cross over are less stable than those without new gene combinations.

Go On ▶

Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

56.

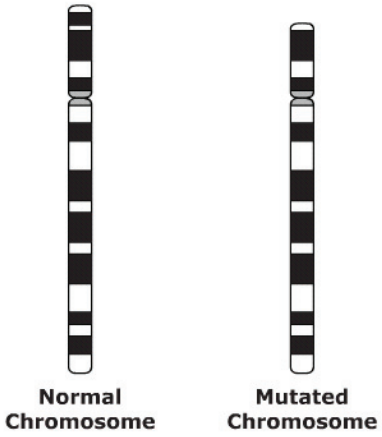
During sexual reproduction, gametes fuse to form a zygote. Sometimes when gametes are formed during meiosis, the chromosomes do not completely separate. When a gamete with an extra chromosome fuses with another gamete to form a zygote, the result is usually the expression of a genetic disorder. This occurrence is an example of which type of chromosomal change?

- **A** duplication
- **B** inversion
- **C** nondisjunction
- **D** translocation

Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

57.

Cri du chat is a genetic disorder that occurs when there is a type of mutation in the fifth chromosome. This change in chromosomal structure is represented in the diagram below.



Which type of mutation causes cri du chat?

- **A** deletion
- **B** duplication
- **C** inversion
- **D** translocation

Go On ▶

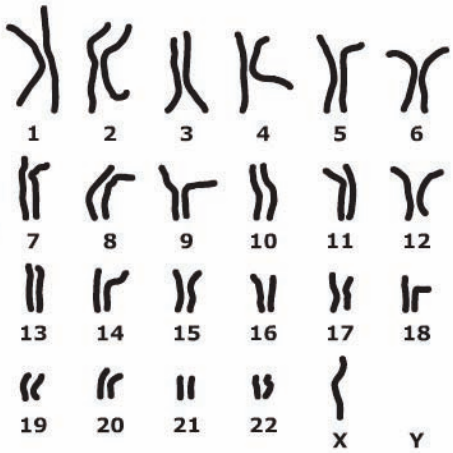
Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

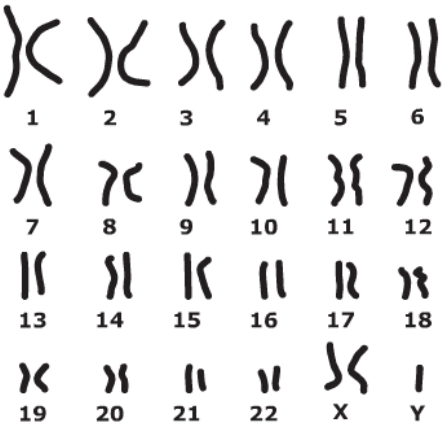
58. **Sickle-cell disease is a genetic disorder that is caused by a DNA mutation that exchanges one base for another, which changes one amino acid in hemoglobin. What is this type of mutation?**

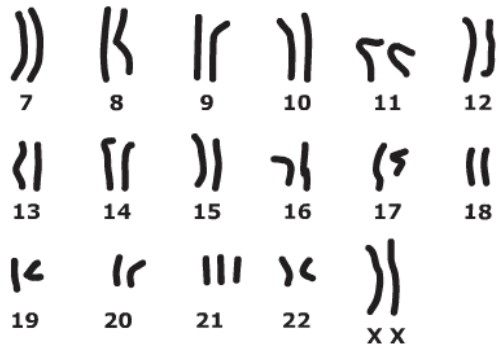
- **A** deletion
- **B** frameshift
- **C** insertion
- **D** point

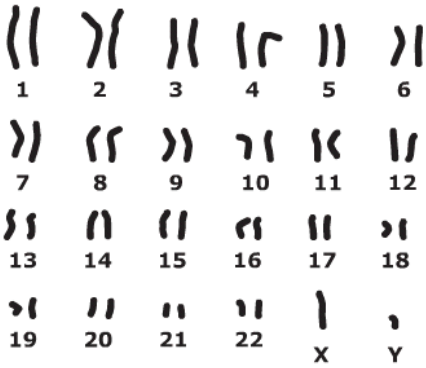
Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

59. **Some human genetic disorders occur during the separation of chromosomes in meiosis. Klinefelter's syndrome is when an additional sex chromosome is present in the cells of the offspring. Which karyotype shows a person with Klinefelter's syndrome?**

- **A** 

- **B** 

- **C** 

- **D** 

Performance Indicator: 3210.4.8 Determine the relationship between mutations and human genetic disorders.

60. **Sickle-cell disease is genetically inherited. A normal red blood cell and a sickled blood cell are shown below.**

Normal Red Blood Cell

Sickled Red Blood Cell

Why do red blood cells have the characteristic sickle shape in this disease?

- **A** The cells change shape when the cells move through the circulatory system.
- **B** The cells have a protein whose structure is changed due to a mutation.
- **C** The cells change shape when oxygen binds to hemoglobin in the cells.
- **D** The cells have mutated lipids that are in the cell membranes.

Performance Indicator: 3210.4.9 Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.

61. **In the United States, it is possible for discoverers of gene sequences in organisms to patent those sequences. This gives the discoverer property rights for the sequence. Many scientists object to this practice. Which is the strongest scientific argument against allowing a gene sequence to be patented?**

- **A** Patenting sequences prevents the sequences from being expressed in nature.
- **B** Patenting sequences prevents the sequences from being used in genetically modified organisms.
- **C** Patenting sequences prevents researchers from studying and creating innovations from the patented sequences.
- **D** Patenting sequences prevents conservationists from understanding the ecological needs of organisms from which the patented sequences come.

Go On ▶

Performance Indicator: 3210.4.9 Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.

62. **There is broad public debate on the ethics of performing research on human stem cells to find cures for human diseases. Which statement describes an ethical issue about the use of human stem cells for research?**

- **A** Some research focuses on stem cells obtained through the destruction of human embryos.
- **B** Any treatments discovered through such research would likely be too expensive for many patients.
- **C** Some research focuses on therapies that would only benefit the person from whom the stem cells came.
- **D** Any treatments discovered through such research would be more effective in treating some patients than others.

Reporting Category 5: Heredity		
Item Number	**Correct Answer**	**Performance Indicator**
1	B	3210.4.1 Identify the structure and function of DNA.
2	C	3210.4.1 Identify the structure and function of DNA.
3	D	3210.4.1 Identify the structure and function of DNA.
4	B	3210.4.1 Identify the structure and function of DNA.
5	B	3210.4.2 Associate the process of DNA replication with its biological significance.
6	A	3210.4.2 Associate the process of DNA replication with its biological significance.
7	C	3210.4.2 Associate the process of DNA replication with its biological significance.
8	B	3210.4.2 Associate the process of DNA replication with its biological significance.
9	A	3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.
10	D	3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.
11	B	3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.
12	D	3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.
13	A	3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.
14	C	3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.
15	C	3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.

16	B	3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.
17	C	3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.
18	A	3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.
19	A	3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.
20	D	3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.
21	C	3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.
22	A	3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.
23	B	3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.
24	C	3210.4.7 Describe how meiosis and sexual reproduction contribute to genetic variation in a population.
25	B	3210.4.7 Describe how meiosis and sexual reproduction contribute to genetic variation in a population.
26	D	3210.4.8 Determine the relationship between mutations and human genetic disorders.
27	C	3210.4.8 Determine the relationship between mutations and human genetic disorders.
28	C	3210.4.8 Determine the relationship between mutations and human genetic disorders.
29	C	3210.4.8 Determine the relationship between mutations and human genetic disorders.
30	B	3210.4.9 Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.
31	A	3210.4.9 Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.

32	A	3210.4.1 Identify the structure and function of DNA.
33	D	3210.4.1 Identify the structure and function of DNA.
34	B	3210.4.1 Identify the structure and function of DNA.
35	C	3210.4.1 Identify the structure and function of DNA.
36	D	3210.4.2 Associate the process of DNA replication with its biological significance.
37	C	3210.4.2 Associate the process of DNA replication with its biological significance.
38	B	3210.4.2 Associate the process of DNA replication with its biological significance.
39	B	3210.4.2 Associate the process of DNA replication with its biological significance.
40	D	3210.4.2 Associate the process of DNA replication with its biological significance.
41	A	3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.
42	B	3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.
43	C	3210.4.3 Recognize the interactions between DNA and RNA during protein synthesis.
44	C	3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.
45	A	3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.
46	D	3210.4.4 Determine the probability of a particular trait in an offspring based on the genotype of the parents and the particular mode of inheritance.
47	D	3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.
48	C	3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.
49	D	3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.

50	D	3210.4.5 Apply pedigree data to interpret various modes of genetic inheritance.
51	C	3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.
52	C	3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.
53	B	3210.4.6 Describe how meiosis is involved in the production of egg and sperm cells.
54	C	3210.4.7 Describe how meiosis and sexual reproduction contribute to genetic variation in a population.
55	A	3210.4.7 Describe how meiosis and sexual reproduction contribute to genetic variation in a population.
56	C	3210.4.8 Determine the relationship between mutations and human genetic disorders.
57	A	3210.4.8 Determine the relationship between mutations and human genetic disorders.
58	D	3210.4.8 Determine the relationship between mutations and human genetic disorders.
59	B	3210.4.8 Determine the relationship between mutations and human genetic disorders.
60	B	3210.4.8 Determine the relationship between mutations and human genetic disorders.
61	C	3210.4.9 Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.
62	A	3210.4.9 Evaluate the scientific and ethical issues associated with gene technologies: genetic engineering, cloning, transgenic organism production, stem cell research, and DNA fingerprinting.