Genetics and Heredity: The Blueprint of Life

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1-800-FOR-AIMS 1-800-367-2467

Congratulations!

You have chosen a learning program that will actively motivate your students AND provide you with easily accessible and easily manageable instructional guidelines designed to make your teaching role efficient and rewarding.

The AIMS Teaching Module provides you with a video program keyed to your classroom curriculum, instructions and guidelines for use, plus a comprehensive teaching program containing a wide range of activities and ideas for interaction between all content areas. Our authors, educators, and consultants have written and reviewed the AIMS Teaching Modules to align with the Educate America Act: Goals 2000.

This ATM, with its clear definition of manageability, both in the classroom and beyond, allows you to tailor specific activities to meet all of your classroom needs.

RATIONALE

In today's classrooms, educational pedagogy is often founded on Benjamin S. Bloom's "Six Levels of Cognitive Complexity." The practical application of Bloom's Taxonomy is to evaluate students' thinking skills on these levels, from the simple to the complex: Knowledge (rote memory skills), Comprehension (the ability to relate or retell), Application (the ability to apply knowledge outside its origin), Analysis (relating and differentiating parts of a whole), Synthesis (relating parts to a whole), and Evaluation (making a judgment or formulating an opinion).

The AIMS Teaching Module is designed to facilitate these intellectual capabilities, AND to integrate classroom experiences and assimilation of learning with the students' life experiences, realities, and expectations. AIMS' learner verification studies prove that our AIMS Teaching Modules help students to absorb, retain, and to demonstrate ability to use new knowledge in their world. Our educational materials are written and designed for today's classroom, which incorporates a wide range of intellectual, cultural, physical, and emotional diversities.

ORGANIZATION AND MANAGEMENT

To facilitate ease in classroom manageability, the AIMS Teaching Module is organized in four sections. You are reading Section 1, Introduction to the Aims Teaching Module (ATM).

SECTION 2,

INTRODUCING THIS ATM will give you the specific information you need to integrate the program into your classroom curriculum.

SECTION 3,

PREPARATION FOR VIEWING provides suggestions and strategies for motivation, language preparedness, readiness, and focus prior to viewing the program with your students.

SECTION 4,

AFTER VIEWING THE PROGRAM provides suggestions for additional activities plus an assortment of consumable assessment and extended activities, designed to broaden comprehension of the topic and to make connections to other curriculum content areas.

FEATURES

INTRODUCING EACH ATM

SECTION 2

Your AIMS Teaching Module is designed to accompany a video program written and produced by some of the world's most credible and creative writers and producers of educational programming. To facilitate diversity and flexibility in your classroom, your AIMS Teaching Module features these components:

Themes

The Major Theme tells how this AIMS Teaching Module is keyed into the curriculum. Related Themes offer suggestions for interaction with other curriculum content areas, enabling teachers to use the teaching module to incorporate the topic into a variety of learning areas.

Overview

The Overview provides a synopsis of content covered in the video program. Its purpose is to give you a summary of the subject matter and to enhance your introductory preparation.

Objectives

The ATM learning objectives provide guidelines for teachers to assess what learners can be expected to gain from each program. After completion of the AIMS Teaching Module, your students will be able to demonstrate dynamic and applied comprehension of the topic.

PREPARATION FOR VIEWING

SECTION 3

In preparation for viewing the video program, the AIMS Teaching Module offers activity and/or discussion ideas that you may use in any order or combination.

Introduction To The Program

Introduction to the Program is designed to enable students to recall or relate prior knowledge about the topic and to prepare them for what they are about to learn.

Introduction To Vocabulary

Introduction to Vocabulary is a review of language used in the program: words, phrases, usage. This vocabulary introduction is designed to ensure that all learners, including limited English proficiency learners, will have full understanding of the language usage in the content of the program.

Discussion Ideas

Discussion Ideas are designed to help you assess students' prior knowledge about the topic and to give students a preview of what they will learn. Active discussion stimulates interest in a subject and can motivate even the most reluctant learner. Listening, as well as speaking, is active participation. Encourage your students to participate at the rate they feel comfortable. Model sharing personal experiences when applicable, and model listening to students' ideas and opinions.

Focus

Help learners set a purpose for watching the program with Focus, designed to give students a focal point for comprehension continuity.

Jump Right In

Jump Right In provides abbreviated instructions for quick management of the program.

AFTER VIEWING THE PROGRAM

SECTION 4

After your students have viewed the program, you may introduce any or all of these activities to interact with other curriculum content areas, provide reinforcement, assess comprehension skills, or provide hands-on and in-depth extended study of the topic.

SUGGESTED ACTIVITIES

The Suggested Activities offer ideas for activities you can direct in the classroom or have your students complete independently, in pairs, or in small work groups after they have viewed the program. To accommodate your range of classroom needs, the activities are organized into skills categories. Their labels will tell you how to identify each activity and help you correlate it into your classroom curriculum. To help you schedule your classroom lesson time, the AIMS hourglass gives you an estimate of the time each activity should require. Some of the activities fall into these categories:

Meeting Individual Needs

These activities are designed to aid in classroom continuity. Reluctant learners and learners acquiring English will benefit from these activities geared to enhance comprehension of language in order to fully grasp content meaning.

MATH

Curriculum Connections

Many of the suggested activities are intended to integrate the content of the ATM program into other content areas of the classroom curriculum. These cross-connections turn the classroom teaching experience into a whole learning experience.



Critical Thinking activities are designed to stimulate learners' own opinions and ideas. These activities require students to use the thinking process to discern fact from opinion, consider their own problems and formulate possible solutions, draw conclusions, discuss cause and effect, or combine what they already know with what they have learned to make inferences.



Cultural Diversity

Each AIMS Teaching Module has an activity called Cultural Awareness, Cultural Diversity, or Cultural Exchange that encourages students to share their backgrounds, cultures, heritage, or knowledge of other countries, customs, and language.



Hands On

These are experimental or tactile activities that relate directly to the material taught in the program. Your students will have opportunities to make discoveries and formulate ideas on their own, based on what they learn in this unit.



Every AIMS Teaching Module will contain an activity designed for students to use the writing process to express their ideas about what they have learned. The writing activity may also help them to make the connection between what they are learning in this unit and how it applies to other content areas.



Each AIMS Teaching Module contains a newsroom activity designed to help students make the relationship between what they learn in the classroom and how it applies in their world. The purpose of In The Newsroom is to actively involve each class member in a whole learning experience. Each student will have an opportunity to perform all of the tasks involved in production: writing, researching, producing, directing, and interviewing as they create their own classroom news program.



These activities provide opportunities for students to work separately or together to conduct further research, explore answers to their own questions, or apply what they have learned to other media or content areas.



Link to the World

These activities offer ideas for connecting learners' classroom activities to their community and the rest of the world.



Culminating Activity

To wrap up the unit, AIMS Teaching Modules offer suggestions for ways to reinforce what students have learned and how they can use their new knowledge to enhance their world view.

VOCABULARY

Every ATM contains an activity that reinforces the meaning and usage of the vocabulary words introduced in the program content. Students will either read or find the definition of each vocabulary word, then use the word in a written sentence.

CHECKING COMPREHENSION

Checking Comprehension is designed to help you evaluate how well your students understand, retain, and recall the information presented in the AIMS Teaching Module. Depending on your students' needs, you may direct this activity to the whole group yourself, or you may want to have students work on the activity page independently, in pairs, or in small groups. Students can verify their written answers through discussion or by viewing the video a second time. If you choose, you can reproduce the answers from your Answer Key or write the answer choices in a Word Bank for students to use. Students can use this completed activity as a study guide to prepare for the test.

CONSUMABLE ACTIVITIES

The AIMS Teaching Module provides a selection of consumable activities, designed to specifically reinforce the content of this learning unit. Whenever applicable, they are arranged in order from low to high difficulty level, to allow a seamless facilitation of the learning process. You may choose to have students take these activities home or to work on them in the classroom independently, in pairs or in small groups.

CHECKING VOCABULARY

The Checking Vocabulary activity provides the opportunity for students to assess their knowledge of new vocabulary with this word game or puzzle. The format of this vocabulary activity allows students to use the related words and phrases in a different context.

TEST

The AIMS Teaching Module Test permits you to assess students' understanding of what they have learned. The test is formatted in one of several standard test formats to give your students a range of experiences in test-taking techniques. Be sure to read, or remind students to read, the directions carefully and to read each answer choice before making a selection. Use the Answer Key to check their answers.

ADDITIONAL AIMS MULTIMEDIA PROGRAMS

After you have completed this AIMS Teaching Module you may be interested in more of the programs that AIMS offers. This list includes several related AIMS programs.

ADDITIONAL READING SUGGESTIONS

AIMS offers a carefully researched list of other resources that you and your students may find rewarding.

ANSWER KEY

Reproduces tests and work pages with answers marked.

Title

THEMES

Genetics and Heredity: The Blueprint of Life explores the role of DNA in reproduction. The processes of mitosis and meiosis are also discussed, with emphasis on the division and infinite variety of genetic material. Dominant and recessive traits are described, as well as mutations and genetic disorders.

OVERVIEW

Genetics and Heredity: The Blueprint of Life is part four of the Biology Essentials series which examines modern-day biology. The program illustrates the structure of DNA and the processes of mitosis and meiosis. It explains how traits are passed between generations, how pure and hybrid traits differ, and how Punnett squares can be used to predict the probability of inheriting a given trait. The program also looks at common genetic disorders and the importance of genetics in medicine and biotechnology.

OBJECTIVES

- To outline the importance of the work of Gregor Mendel.
- To illustrate the shape and composition of DNA molecules.
- To describe genes and chromosomes.
- To explain the difference between dominant and recessive traits.
- ► To describe the difference between a pure and hybrid trait.
- To use a Punnett square to predict the likelihood of a single gene trait being passed to an offspring.
- To list a number of genetic illnesses.

Use this page for your individual notes about planning and/or effective ways to manage this AIMS Teaching Module in your classroom.

Our AIMS Multimedia Educational Department welcomes your observations and comments. Please feel free to address your correspondence to:

> AIMS Multimedia Editorial Department 9710 DeSoto Avenue Chatsworth, California 91311-4409

INTRODUCTION TO THE PROGRAM

Ask the class to name as many human traits as they can. Include general traits such as hair color, height, intelligence, musical talent, and so on. List the responses on the board and ask students to think about their own specific characteristics. Where did these traits come from? Can they recognize a strong family trait, such as large noses or red hair? Do they have traits that can't be attributed to either parent? How did they become such a complicated mix of their family and their own unique self?

INTRODUCTION TO VOCABULARY

Taking a close look at the history of a word can give us a better understanding of the word's meaning. "Genetic" is related to the word "genesis." Ask students to explain the meaning of genesis. (Genesis means the origin or coming into being of something; To be born.)

"Heredity" can be traced back to an ancient form of the word "heir." What is the meaning of heir? (An heir is one who receives the property, rank, title or qualities of a parent.)

DISCUSSION IDEAS

Early scientists could plainly see inherited traits in the faces of their subjects. Yet, they had no concrete ideas about how this information was passed on. Some scientists, including Aristotle, thought that genetic traits were passed on through blood. Ask students to consider the expressions "it's in the blood," "blood line," blue blood," and "blood relative." What does each phrase mean? Are they accurate descriptions of how heredity works? (Not really, since genetic material is found in all cells, not just blood cells.)

FOCUS

Discuss with students the importance of learning more about heredity and genetics. How might our developing knowledge of these subjects contribute to the prevention of disease, the evolution of a smarter and healthier population, and an increased life span? Tell students they are going to learn more about the fascinating world of genetics, and the many useful possibilities that it holds.

JUMP RIGHT IN

HOW TO USE THE GENETICS AND HEREDITY: THE BLUPRINT OF LIFE AIMS TEACHING MODULE

Preparation

- Read Genetics and Heredity: The Blueprint of Life Themes, Overview, and Objectives to become familiar with program content and expectations.
- Use Preparation for Viewing suggestions to introduce the topic to students.

Viewing GENETICS AND HEREDITY: THE BLUEPRINT OF LIFE

- Set up viewing monitor so that all students have a clear view.
- Depending on your classroom size and learning range, you may choose to have students view Genetics and Heredity: The Blueprint of Lifetogether or in small groups.
- Some students may benefit from viewing the video more than one time.

After Viewing GENETICS AND HEREDITY: THE BLUEPRINT OF LIFE

- Select Suggested Activities that integrate into your classroom curriculum. If applicable, gather materials or resources.
- Choose the best way for students to work on each activity. Some activities work best for the whole group. Other activities are designed for students to work independently, in pairs, or in small groups. Whenever possible, encourage students to share their work with the rest of the group.
- Duplicate the appropriate number of Vocabulary, Checking Comprehension, and consumable activity pages for your students.
- You may choose to have students take consumable activities home, or complete them in the classroom, independently, or in groups.
- Administer the Test to assess students' comprehension of what they have learned, and to provide them with practice in test-taking procedures.
- Use the Culminating Activity as a forum for students to display, summarize, extend, or share what they have learned with each other, the rest of the school, or a local community organization.

SUGGESTED ACTIVITIES

Connection to History

Many great thinkers have contributed to the study of genetics over the last two-hundred years. Some of the leading pioneers included Casper Friedrich Wolff, Jean Baptiste Lamarck, Gregor Mendel, Thomas Hunt Morgan, Alfred H. Sturtevant, George W. Beadle and Edward L. Tatum, James Watson and Francis H.C. Crick.

Ask students to choose one of these men and investigate their specific contributions. Have them summarize their findings in a one-page paper. What kind of science did each man practice? What did they use in their genetic experiments? What did they add to the expanding world of genetic knowledge?

Cultural Diversity

Eugenics is a social movement that aims to improve the human race by encouraging healthy, intelligent people to reproduce, and discouraging the reproduction of people who are mentally and physically inferior. At the beginning of the 20th century, laws were passed in several countries, including the U.S., to prevent the mentally and physically ill from having children. The most appalling example of eugenics occurred in Nazi Germany, when people labeled inferior were driven from society and killed in death camps. Most of these laws were done away with when people complained that eugenics was a violation of basic human rights.

What might be a fatal flaw with the eugenics theory? What factors, other than genetics, are crucial to the success of a race? Although Hitler convinced many Germans that their superiority was genetic and unchangeable, he used social influences to greatly change their behavior. How was he contradicting himself?

Connection to Art

Ask students to draw each phase of mitosis using colored pencils. In each phase, have them label the cell wall, nucleus, chromosomes or chromatids, centromere, cytoplasm and microtubules. Perhaps students will choose to illustrate the mitosis of a specific cell, such as a red blood cell or a liver cell. Display the finished drawings on a wall labeled, "The Mitosis Gallery."



60 Minutes







Writing

What possibilities might genetic engineering hold for the world? What would our society be like if everyone was "perfect"? Encourage students to share their ideas in a short class discussion. Then, ask each student to pretend they are living five-hundred years in the future. Have them write a one-page diary entry describing what they encounter in a typical day. Do they enjoy their lives? What kind of friends do they have? What type of activities are they involved in? What kind of problems, if any, do they experience?

Meeting Individual Needs

Ask students to look up the words "genotype" and "phenotype" in the dictionary. What does each word mean? Can you name some examples of your phenotype? How are the words related?

Phenotype is the collection of an organism's physical characteristics. Genotype is the collection of an organism's genetic material. Examples of phenotype can include curly hair, blue eyes and small hands. A person's genotype guides the person's resulting phenotype.

Extended Activity

Hereditary diseases are passed from generation to generation. Hemophilia, muscular dystrophy, cystic fibrosis, Huntington's disease and sickle-cell anemia are some of the most serious of these diseases. Many of these inherited illnesses can be detected soon after birth. In fact, modern medicine even allows some diseases to be spotted before birth.

Ask students to choose a hereditary disease and study it more closely. What causes the disease? Which parts of the body are affected and how? What treatments are available for the disease? How common is the disease, and what type of person is most likely to get it? Have students present their findings in a short presentation to the class.

In the Newsroom

Magazines and newspapers are filled with stories about genetic engineering and cloning. Instruct students to gather articles and books with information on these subjects. Encourage them to compare their findings to uncover any misleading or controversial information. Have them put together a news show based on their "investigative reporting." News reports, interviews and editorials can all be included. If audio or video equipment is available, have the class record their presentations. Get everyone involved in the project by letting students choose to write, research, produce, direct or interview.









120 Minutes

Hands On

A pedigree chart is something that usually makes us think of dog or horse breeding. In fact, pedigree charts can be drawn for any species, including humans. Locate some examples of pedigree charts from resource or library books. After going over the basic structure with students, ask them to draw their own pedigree chart. The chart should center around one of their inherited traits, such as blond hair or freckles. Encourage them to check with their parents and other family members to discover the prevalence of this family trait. What seems to be the pattern of the trait? Do they think the trait is recessive or dominant?

Culminating Activity

Divide students into two interactive groups. Assign one group to be mitosis and the other meiosis. Instruct each group to prepare a skit illustrating each phase of their assigned process. Some students will be microtubules, others chromatids and centromeres. The cell wall and nucleus should also be represented. In addition, one student from each group should serve as the narrator, describing each phase as it occurs.





VOCABULARY

The following vocabulary words are from *Genetics and Heredity: The Blueprint of Life*. Fill in the number of each word next to its closest definition.

- 1. anaphase
- 2. centromere
- 3. chromosomes
- 4. DNA
- 5. genes
- 6. hybrid
- 7. interphase
- 8. meiosis
- 9. metaphase
- 10. mitosis
- 11. mutations
- 12. prophase
- 13. Punnett square
- 14. pure
- 15. telophase
- _____ cellular materials that pass traits from parent to offspring
- _____ type of cell division that produces an exact copy of the parent cell
- _____ time in a cell's life when mitosis is not occurring
- _____ special region that joins matching chromosomes during cell division
- ____ phase of cell division in which microtubules attach to chromatids and pull them to the center of the cell
- _____ trait that occurs when two genes in a gene pair are the same
- ____ molecular substance that carries information used by cells to synthesize proteins and control other life processes
- _____ diagram used to predict the probability that an offspring will inherit a given trait
- ____ phase of cell division in which chromosomes condense tightly into matched pairs
- _____ final phase of cell division in which chromosomes extend back into their relaxed state and the cytoplasm splits in two
- ____ coiled strands in the cell nuclei that contain genetic information
- _____ trait that occurs when two genes in a gene pair are different
- _____ type of cell division that produces cells used in sexual reproduction
- _____ spontaneous changes that occur in genetic material
- ____ phase of cell division in which the centromere divides and the chromatids are pulled to opposite sides of the cell

CHECKING COMPREHENSION

Read the following sentences and circle the letters of the words that best fill each blank.

DNA, or deoxyribonucleic acid, is molecular material found in the cells of ____1___. DNA molecules contain information that is used by cells to synthesize ____2___. Long threads of DNA are coiled and folded into strands called ____3___. Mitosis is a type of cell division which produces ____4____ of the parent cell. Meiosis is a type of cell division that produces cells used in ____5___. ___6____ is the phase in a cell's life when mitosis is not occurring. During prophase , matching pairs of chromosomes are joined together by a ____7___. During metaphase, ____8___ pull the chromosomes to the center of the cell. The centromere divides during ____9____, and the individual chromosomes move to opposite sides of the cell. During telophase, the nuclear material forms around the chromosomes, and the ____10_____ splits into two equal parts.

- 1. A. humans and animals
 - B. higher organisms
 - C. some plants and animals
 - D. all organisms
- 2. A. proteins
 - B. energy
 - C. nerve impulses
 - D. water
- 3. A. nuclei
 - B. chromosomes
 - C. centrioles
 - D. microtubules
- 4. A. a mutation
 - B. a close replica
 - C. an exact copy
 - D. one half
- 5. A. digestion
 - B. circulation
 - C. sensory organs
 - D. reproduction

- 6. A. Interphase
 - B. Telophase
 - C. Chromophase
 - D. Anaphase
- 7. A. chromatid
 - B. centromere
 - C. spiral tubule
 - D. cytoplasmere
- 8. A. microtubules
 - B. genomes
 - C. chromatids
 - D. nuclei
- 9. A. telophase
 - B. interphase
 - C. anaphase
 - D. metaphase
- 10. A. hemoglobin
 - B. cytoplasm
 - C. microtubule
 - D. centromere

PHASES OF MITOSIS

Each sentence below describes a process that takes place during mitosis. Label each process according to which phase it occurs in. Use a P for prophase, M for metaphase, A for anaphase and T for telophase.

- 1. ____ Microtubules at either end of the cell attach to the chromatids.
- 2. ____ Individual chromosomes extend back into their relaxed state.
- 3. ____ Microtubules pull at the chromatids, placing them in the middle of the cell
- 4. ____ The chromosomes condense tightly into matching pairs.
- 5. ____ Nuclear material forms around the chromosomes while the cytoplasm splits.
- 6. <u>Matched pairs of chromosomes are joined by a region called the centromere.</u>
- 7. ____ The centromere divides and the chromatids are pulled to opposite sides of the cell.
- 8. ____ Small fibers called microtubules begin to form at each end of the cell.)

TRUE OR FALSE

Place a T next to statements that are true and an F next to statements that are false.

- 1. ____ Genetic counselors can tell couples the exact genes that they will pass on to their offspring.
- 2. ____ Gregor Mendel developed his genetic theories by studying peas in a garden.
- 3. ____ Meiosis produces sex cells that have the same number of chromosomes as other cells in the organism.
- 4. ____ During prophase, chromatids are pulled to opposite sides of the cell.
- 5. ____ If a child inherited one freckle gene and one non-freckle gene, the trait would be hybrid.
- 6. ____ The result of meiosis is four sex cells, all with different genetic combinations than the parent cell.
- 7. ____ Punnett squares reflect all of the possible combinations of genes that an offspring can inherit.
- 8. ____ All mutations enhance an organism's ability to survive.
- 9. ____ Genetic engineering allows scientists to create their own mutations in organisms.
- 10. ____ Genes are arranged in coiled strands called centromeres.

GENETIC MATCH-UP

Match each term on the left with the most appropriate group of words on the right.

1.	meiosis	phase between mitosis
2.	microtubules	part of meiosis in which genes are cut and snipped
3.	prophase one	produces sperm and eggs
4.	hybrid	genetically inherited disease
5.	hemophilia	spontaneous genetic changes
6.	proteins	pull on chromosomes in a cellular tug-of-war
7.	mutations	DNA tells cells how to synthesize these
8.	interphase	trait that results from two different genes

VOCABULARY SEARCH

The following words can be found in the maze below. The letters may be arranged horizontally, vertically, diagonally or backward.

ANAPHASE
CHROMOSOME
DNA
GENES
HYBRID
INTERPHASE
MEIOSIS
MITOSIS
PURE
TRAIT

Е	F	А	Μ	С	Q	S	С	V	Ι	Y	Н
Μ	Ι	Ν	Т	Е	R	Ρ	Н	А	S	Е	W
Ι	С	А	G	Т	Ι	J	R	G	Ν	D	S
Т	F	Р	L	Е	W	R	0	А	L	Н	Т
0	R	Н	В	Κ	Ν	Μ	Μ	В	0	Р	L
S	Κ	А	Q	S	J	Е	0	Р	U	R	Е
Ι	0	S	I	А	Κ	Ι	S	J	Т	Р	Н
S	R	Ε	U	Т	L	0	0	Ν	В	R	Y
Х	В	Μ	D	С	G	S	Μ	D	Н	Т	В
С	Е	0	J	Κ	Q	Ι	Ε	Х	Е	Q	R
Y	Ζ	V	Y	А	Μ	S	U	Р	В	L	Ι
А	Ν	D	Ι	G	R	Х	Р	Y	W	Т	D

TEST

Circle the correct answer

- 1. What is the basic molecule that makes up genes?
 - chromosomes
 - deoxyribonucleic acid
 - nucleotides
 - paramecium
- 2. The first person to develop genetic theory in the late 1800s was:
 - Charles Darwin.
 - Paul Punnett.
 - Gregor Mendel.
 - Francis Crick.
- 3. Which of the following shows the stages of mitosis in the correct order?
 - periphase, anaphase, metaphase, telophase
 - metaphase, prophase, anaphase, interphase
 - telophase, prophase, metaphase, anaphase
 - prophase, metaphase, anaphase, telophase
- 4. Mitosis does not occur during:
 - interphase.
 - metaphase.
 - telophase.
 - prophase.
- 5. If two genes in a gene pair are for the same trait, the trait will be:
 - inherited from the father.
 - pure.
 - inherited from the mother.
 - hybrid.

TEST (CONTINUED)

6. Which of the following statements is false?

- The genes which make up chromosomes are responsible for defining traits. .
- Individuals have at least one pair of genes for each trait they have.
- Only the recessive gene is expressed in hybrid traits.
- If two genes in a gene pair are for different traits, the resulting trait will be hybrid.
- 7. The ______ is used to visualize the likelihood that offspring will inherit a given trait.
 - genetic circle
 - Mendel model
 - Punnett square
 - periodical table
- 8. Which of the following is not a genetic disorder?
 - hemophilia
 - Huntington's disease
 - malaria
 - sickle-cell anemia
- 9. The process of genetic engineering:
 - works to change outcomes of traits by altering genetic material.
 - is the manipulation of the genetic code in an attempt to improve a species.
 - allows scientists to create their own mutations in organisms.
 - all of the above.
- 10. Chromosomes inherited from the father are called:
 - maternal chromosomes.
 - primary chromosomes.
 - paternal chromosomes.
 - secondary chromosomes.

ADDITIONAL AIMS MULTIMEDIA PROGRAMS

You and your students might also enjoy these other AIMS Multimedia programs:

The Human Body: The Ultimate Machine Cells: The Building Blocks of Life The Web of Life: Producer to Predator The World's Biomes: Desert to Rainforest Classification: Bringing Order to Diversity

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- 8. meiosis
- 9. metaphase
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- 11. mutations
- 12. prophase
- 13. Punnett square
- 14. pure
- 15. telophase
- <u>5</u> cellular materials that pass traits from parent to offspring
- 10 type of cell division that produces an exact copy of the parent cell
- 7 time in a cell's life when mitosis is not occurring
- <u>2</u> special region that joins matching chromosomes during cell division
- 9 phase of cell division in which microtubules attach to chromatids and pull them to the center of the cell
- 14 trait that occurs when two genes in a gene pair are the same
- <u>4</u> molecular substance that carries information used by cells to synthesize proteins and control other life processes
- 13 diagram used to predict the probability that an offspring will inherit a given trait
- 12 phase of cell division in which chromosomes condense tightly into matched pairs
- 15 final phase of cell division in which chromosomes extend back into their relaxed state and the cytoplasm splits in two
- <u>3</u> coiled strands in the cell nuclei that contain genetic information
- _6_ trait that occurs when two genes in a gene pair are different
- <u>8</u> type of cell division that produces cells used in sexual reproduction
- <u>11</u> spontaneous changes that occur in genetic material
- <u>1</u> phase of cell division in which the centromere divides and the chromatids are pulled to opposite sides of the cell

CHECKING COMPREHENSION

Read the following sentences and circle the letters of the words that best fill each blank.

DNA, or deoxyribonucleic acid, is molecular material found in the cells of ____1___. DNA molecules contain information that is used by cells to synthesize ____2___. Long threads of DNA are coiled and folded into strands called ____3___. Mitosis is a type of cell division which produces ____4____ of the parent cell. Meiosis is a type of cell division that produces cells used in ____5____. ___6____ is the phase in a cell's life when mitosis is not occurring. During prophase , matching pairs of chromosomes are joined together by a ____7____. During metaphase, ____8____ pull the chromosomes to the center of the cell. The centromere divides during ____9____, and the individual chromosomes move to opposite sides of the cell. During telophase, the nuclear material forms around the chromosomes, and the ____10_____ splits into two equal parts.

- 1. A. humans and animals
 - B. higher organisms
 - <u>C</u>. some plants and animals
 - (D.) all organisms
- 2. (A) proteins
 - B. energy
 - C. nerve impulses
 - D. water
- 3. A. nuclei
 - B.) chromosomes
 - C. centrioles
 - D. microtubules
- A. a mutation
 B. a close replica
 C. an exact copy
 D. one half
- 5. A. digestion
 - B. circulation
 - C. sensory organs
 - D) reproduction

- b. (A) Interphase
 - B. Telophase
 - C. Chromophase
 - D. Anaphase
- 7. <u>A</u>. chromatid
 - B) centromere
 - C. spiral tubule
 - D. cytoplasmere
- 8. (A) microtubules B. genomes
 - C. chromatids
 - D. nuclei
- 9. A. telophase B. interphase
 - (C.) anaphase D. metaphase
 - D. metaphase
 - 0. A. hemoglobin
 - B.) cytoplasm
 - C. microtubule
 - D. centromere

PHASES OF MITOSIS

Each sentence below describes a process that takes place during mitosis. Label each process according to which phase it occurs in. Use a P for prophase, M for metaphase, A for anaphase and T for telophase.

- 1. <u>M</u> Microtubules at either end of the cell attach to the chromatids.
- 2. <u>T</u> Individual chromosomes extend back into their relaxed state.
- 3. <u>M</u> Microtubules pull at the chromatids, placing them in the middle of the cell
- 4. <u>P</u> The chromosomes condense tightly into matching pairs.
- 5. <u>T</u> Nuclear material forms around the chromosomes while the cytoplasm splits.
- 6. <u>P</u> Matched pairs of chromosomes are joined by a region called the centromere.
- 7. <u>A</u> The centromere divides and the chromatids are pulled to opposite sides of the cell.
- 8. <u>P</u> Small fibers called microtubules begin to form at each end of the cell.

TRUE OR FALSE

Place a T next to statements that are true and an F next to statements that are false.

- 1. <u>F</u> Genetic counselors can tell couples the exact genes that they will pass on to their offspring.
- 2. <u>T</u> Gregor Mendel developed his genetic theories by studying peas in a garden.
- 3. <u>F</u> Meiosis produces sex cells that have the same number of chromosomes as other cells in the organism.
- 4. <u>F</u> During prophase, chromatids are pulled to opposite sides of the cell.
- 5. <u>T</u> If a child inherited one freckle gene and one non-freckle gene, the trait would be hybrid.
- 6. <u>T</u> The result of meiosis is four sex cells, all with different genetic combinations than the parent cell.
- 7. <u>T</u> Punnett squares reflect all of the possible combinations of genes that an offspring can inherit.
- 8. <u>F</u> All mutations enhance an organism's ability to survive.
- 9. <u>T</u> Genetic engineering allows scientists to create their own mutations in organisms.
- 10. <u>F</u> Genes are arranged in coiled strands called centromeres.

GENETIC MATCH-UP

Match each term on the left with the most appropriate group of words on the right.



VOCABULARY SEARCH

The following words can be found in the maze below. The letters may be arranged horizontally, vertically, diagonally or backward.



		\frown									
Е	F	A	Μ	С	Q	S	С	V	Ι	Υ	Н
M		Ν	Т	Е	R	Р	Н	А	S	E	W
I	С	A	G	T	Т	J	R	G	Ν	D	S
T	F	Р	L	E	W	R	0	А	L	Н	Т
0	R	Н	В	К	N	M	М	В	0	Р	L
S	к	A	Q	S	J	E	0	P	U	R	E
I	0	S	1	A	К		S	J	Т	Р	H
S	R	E	U	$\overline{)}$	L	0	0	Ν	В	R	Y
Х	В	Μ	D	С	G	S	Μ	D	Н	Т	В
С	Е	0	J	К	Q	1	Ε	Х	Ε	Q	R
Y	Ζ	V	Y	А	Μ	S	U	Ρ	В	L	1
A	Ν	D	I	G	R	Х	Р	Y	W	Т	D

TEST

Circle the correct answer

- 1. What is the basic molecule that makes up genes?
 - chromosomes
 - deoxyribonucleic acid
 - nucleotides
 - paramecium
- 2. The first person to develop genetic theory in the late 1800s was:
 - Charles Darwin.
 - Paul Punnett.
 - Gregor Mendel.
 - Francis Crick.
- 3. Which of the following shows the stages of mitosis in the correct order?
 - periphase, anaphase, metaphase, telophase
 - metaphase, prophase, anaphase, interphase
 - telophase, prophase, metaphase, anaphase
 - prophase, metaphase, anaphase, telophase
- 4. Mitosis does not occur during:
 - interphase.)
 - metaphase.
 - telophase.
 - prophase.
- 5. If two genes in a gene pair are for the same trait, the trait will be:
 - inherited from the father.
 - pure.
 - inherited from the mother.
 - hybrid.

TEST (CONTINUED)

6. Which of the following statements is false?

- The genes which make up chromosomes are responsible for defining traits. .
- Individuals have at least one pair of genes for each trait they have.
- Only the recessive gene is expressed in hybrid traits.
- If two genes in a gene pair are for different traits, the resulting trait will be hybrid.
- 7. The ______ is used to visualize the likelihood that offspring will inherit a given trait.
 - genetic circle
 - Mendel model
 - Punnett square
 - periodical table
- 8. Which of the following is not a genetic disorder?
 - hemophilia
 - Huntington's disease
 - malaria
 - sickle-cell anemia
- 9. The process of genetic engineering:
 - works to change outcomes of traits by altering genetic material.
 - is the manipulation of the genetic code in an attempt to improve a species.
 - allows scientists to create their own mutations in organisms.
 - (• all of the above.)
- 10. Chromosomes inherited from the father are called:
 - maternal chromosomes.
 - primary chromosomes.
 - paternal chromosomes.)
 - secondary chromosomes.