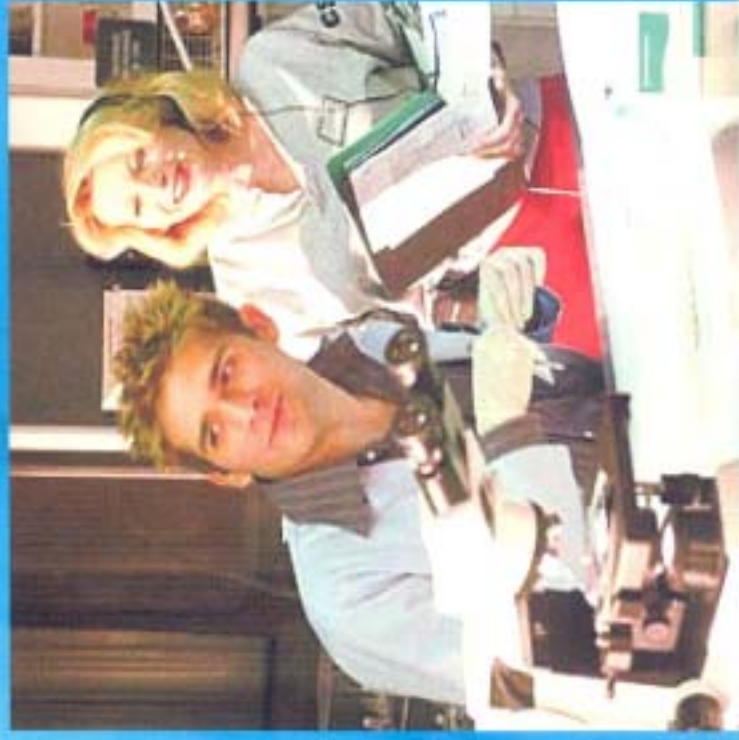
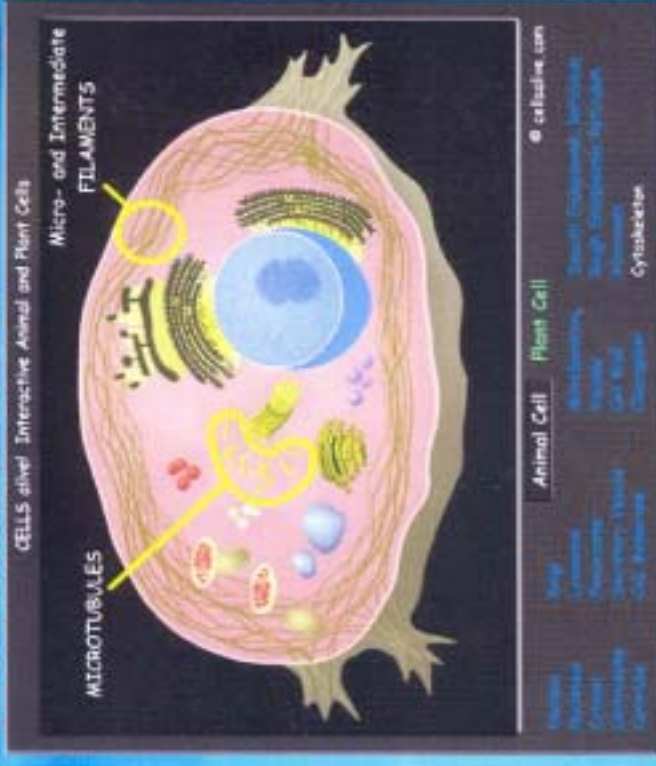


# From hard Cell



# To soft cell



# Don't cell yourcellf short

A study of cellular structure & function

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**Unit Title:**  
**A Study of Cellular Structure and Function**

**OVERVIEW**

**I. CONTENT:**

Students will:

Understand that the cell is the fundamental unit of life and will understand the basic form and function of cells and cell structures. View cell biology from an historical perspective, and recognize moral and ethical issues involved in the study of cell biology.

**II. PROCESS:**

Students will be given a variety of activities that will enable them to know and understand cell biology from a variety of perspectives. All students will:

- a. Exercise sound reasoning through making complex choices and decisions; Identifying and asking significant questions that clarify various points of view and lead to better solutions; Framing and analyzing, and synthesizing information in order to solve problems and answer questions; Evaluating information critically and competently and using information accurately and creatively for the issue or problem at hand.
- b. Formulate scientific questions about an issue and define experimental procedures for finding answers by Planning and conducting practical tests to solve problems or answer a question, collecting and analyzing data using appropriate instruments and techniques safely and accurately.
- c. Develop models and explanations to fit evidence obtained from investigations.
- d. Demonstrate the ability to work effectively with diverse teams.

**III. PRODUCT:**

- a. Demonstrate originality and inventiveness in work.
- b. Act on creative ideas to make a tangible and useful contribution to the domain in which the innovation occurs.
- c. Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
- d. Assume shared responsibility for collaborative work
- e. Use technology as a tool to research, organize, evaluate and communicate information, and the possession of a fundamental understanding of the problem at hand
- f. Select and use appropriate scientific vocabulary to orally share and communicate scientific ideas, plans, results, and conclusions resulting from observations and investigations.
- g. Create written reports and journals to share and communicate scientific ideas, plans, results, and conclusions resulting from observations and investigations.
- h. Create multimedia presentations incorporating numeric, symbolic and/or graphic modes of representation to share scientific ideas, plans, results and conclusions.
- i. Model solutions to a range of problems in science and technology using computer simulation software.
- j. Use secure electronic networks to share information

**Unit Overview: Alignment with  
New Jersey Core Curriculum Content Standards**

**Overarching Benchmarks / Standards / Goals for unit of study:**

**Benchmark 1: 5.5.12 Reproduction and Heredity:**

Standard A: Understand that there are moral and ethical issues which encompass cell biology.

Standard B: Describe how information is encoded and transmitted in genetic material.

Standard C: Explain how genetic material can be altered by natural and/or artificial means and how mutations and new gene combinations may have positive, negative, or no effect on organisms or species.

Standard D: Assess the impact of current and emerging technologies on our understanding of inherited human characteristics.

**Benchmark 2:** 5.2.12 A. Cultural Contributions

Standard A: Recognize the role of the scientific community in responding to changing social and political conditions and how scientific and technological achievement effect historical events.

**Benchmark 3:** 5.2.12 B. Historical Perspectives

Standard A: Examine the lives and contributions of important scientists who effected major breakthroughs in understanding of the natural and designed world.

Standard B: Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.

Standard C: Describe the historical origin of important scientific developments such as atomic theory, genetics, and plate tectonics showing how scientific theories develop, are tested, and can be replaced or modified in light of new information and improved investigative techniques.

**I-SEARCH INDEPENDENT RESEARCH PROJECTS  
FOR GIFTED AND TALENTED STUDENTS**

**1. PARADOXES:**

The common notion in science is that in the field of medicine, saving lives is always paramount. The paradox in genetic research is that the cure for many diseases is held in stem cell research, but this would require the development of embryos purely for the purpose of being aborted for research. Make a T-chart showing the pros and cons of stem-cell research.

**2. ATTRIBUTES:**

Research one area of genetic engineering learned in this unit. Write a letter petitioning the President's Council for Bioethics asking the council to consider legalizing the procedure to make this readily available to those whose lives could be saved. Include specific aspects of the procedure studied.

**3. ANALOGIES:**

Using the area chosen in I-Search #2, compare it to another procedure that was standard at least 30 years ago. Write a soliloquy saying good-bye to the old procedure.

**4. DISCREPANCIES:**

Using the analogy in I-Search #3, create a time line listing the major steps taken in modifying the old procedure to becoming the new improved procedure. Include in your timeline, significant dates, people, and how the procedure was adopted for use in the field of medicine.

**5. PROVOCATIVE QUESTIONS:**

Summons to discovering new knowledge.

Explore the pros and cons of stem cell research. Draw a political cartoon to illustrate your viewpoint on the issue.

**6. EXAMPLES OF CHANGE:**

Create a pictorial, labeled timeline, which depicts the evolution of a horse from its origin to present day.

**7. EXAMPLES OF HABIT:**

Construct a survey for at least ten people, from your class, to see how much time they spend, for one designated week, making sure that their DEAD cells look nice, i.e. nails, skin, and hair.

**8. ORGANIZED RANDOM SEARCH:**

Construct a pictorial maze in which sperm travels along the path which leads to the egg, and then through all stages of fetal development to birth.

**9. SKILLS OF SEARCH:**

Research the history and uses of the incubation process of bacteria. Make a crossword puzzle that includes key terms of your research.

**10. TOLERANCE FOR AMBIGUITY:**

Read Katherine MacLean's "Contagion", from the Holt Anthology of Science Fiction. Write a two-minute speech offering your point of view on becoming a "NEW" Pat or Patricia Mead.

### **11. INTUITIVE EXPRESSION:**

Cells are responsible for several different functions. Lists 4-5 different functions of a cell.

Product : write a journal entry from the perspective of a cell, detailing the day's activities, and the thoughts and emotions that are felt.

### **12. ADJUSTMENT TO DEVELOPMENT:**

In 1928, Alexander Fleming was testing a theory on the antibacterial effects of nasal mucus. He left a plate smeared with Staphylococcus bacteria and went on a two week vacation. When he got back, he noticed that one of his plates had been contaminated. This led to the discovery of penicillin. Many scientific discoveries are the results of adjusting to failure, or a matter of chance.

Product: Research a scientific discovery, and the events that led to the finding. Write a play about it, and act out key moments that led to the discovery, in front of the class.

### **13. STUDY CREATIVE PEOPLE AND PROCESS:**

Leonardo Da Vinci was an important artist, scientist, inventor, and leader during the Renaissance.

Product: Research and study the life of this amazing individual. Create a short biography that depicts Da Vinci's life, contributions, and his thinking process that led to his amazing discoveries and inventions.

### **14. EVALUATE SITUATIONS:**

Cloning of plants and animals is now possible due to recent advancements in the field of genetics. Human cloning has huge implications and controversies associated with it. Cloning may provide a means of advancing human-based research into diseases and afflictions (such as paralysis, organ donation, stem cell research, etc.). There are also ethical and moral considerations that must be analyzed.

Product: Write a plot summary for a new movie which involves a family that would benefit greatly from a clone of their infant son and all of the horrible things that could go wrong once the clone is created.

### **15. CREATIVE READING SKILL:**

The visual media of print, TV shows and commercials focus on different groups to sell and inform us of different information or ideas.

Product: Analyze the cover of Rolling Stone or other teen oriented magazine. Create a poster that decodes describes the visual and verbal messages and the assumptions they make.

### **16. CREATIVE LISTENING SKILL:**

Learn the skill of generating ideas by listening.

Listen for information allowing one thing to lead to another.

Listen to a reading of Abraham Lincoln's second inaugural address.

Create two political cartoons on your reaction to the address. One cartoon from the Northern perspective and one from the southern perspective tying in the need for adapting and surviving.

### **17. CREATIVE WRITING SKILL:**

Read the novel "The Giver". Based on your understanding of adaptation and survival, write the next chapter that explains Jonah and Gabriel's fate.

### **18. VISUALIZATION SKILL:**

Native Americans recorded their history with drawings and symbols. Develop and draw a picture story, using Native American symbols, that explores a situation in which you adapted. (A move, a loss, a new team, etc.)

**ACADEMIC / CRITICAL THINKING SKILLS**  
**ANALYZING HUMAN ACTIVITIES! (AHA!)**

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STATE STANDARD # 5.5.12 STUDENTS WILL BE ABLE TO Describe how information is encoded and transmitted in genetic material.

ESSENTIAL QUESTION: How does the Universal Theme of **Producing, Exchanging and Distributing** create mastery learning of essential concepts in this unit?

**1. PRODUCING, EXCHANGING, AND DISTRIBUTING [ECONOMICS]**

Textbook or Database: Glencoe Biology (textbook), biologygmh.com (database).

**KNOWLEDGE:**

Describe the process of Mitosis and Meiosis.

**Anticipatory Set:** Show a short clip from the beginning of the movie “Look who’s Talking” that depicts the journey of the sperm on the way to the egg.

**Students will:** Trace the journey of a sperm cell as it attempts to connect with the egg cell.

**Formative Assessment:** Students to relate the process of meiosis to compare and contrast sperm and egg cells.

**COMPREHENSION:**

Students will infer the sex of the child based on how quickly sperm swim toward the egg and will generalize the conclusion that there is a 50/50 chance of having a male or a female.

**APPLICATION:**

**Anchoring Activity / Anticipatory Set:** Watch a short segment of National Geographic Channel’s video “What would happen to the earth after humans.

**Students will create a** short video showing how life on earth would change if the human population were unable to reproduce.

**Formative Assessment / Rubric for Product:** Students to work in groups to produce video and write accompanying short essay.

**Multicultural and/or ESL and/or Bilingual Link:** Students to research population trends in developing and developing nations and explain why the population in some countries is growing exponentially while the population of other, more developed nations, are stabilizing.

**Mathematics Link:** Students to produce charts and graphs in order to compare the population changes of various nations.

**School-to-Career/Tech Prep Link:** Genetic Councilor.

**HIGHER ORDER THINKING SKILLS (H.O.T.S.):**

**Anchoring Activity / Anticipatory Set:** Students to read article examining the use of population control in China.

**Students will:** Research the lives of individual families from China who were affected by this dilemma.

**Class/team/individual product:** Oral presentation of findings.

**INDIVIDUAL JOURNAL ASSIGNMENT:**

Write a persuasive letter to the leader of the Chinese Government explaining why he should keep/change the current policies relating to population control in China.

**HOMELINK:**

Discuss letter with family members and get their opinion.

STATE STANDARD # 5.5.12A 1 STUDENTS WILL BE ABLE TO Relate the structure of molecules to their function in cellular structure and metabolism.

ESSENTIAL QUESTION: How does the Universal Theme of **Transportation** create mastery learning of essential concepts in this unit?

## 2. TRANSPORTATION

Textbook or Database: Textbook or Database: Glencoe Biology (textbook), cellsalive.com (database).

### KNOWLEDGE:

**Anticipatory Set:** View live video stream of an actual cell as it transports materials.

**Students will:** Students will be able to connect to vocabulary related to cells transporting materials in and out.

### COMPREHENSION:

Laboratory activity on diffusion. Students to calculate the distance of diffusion of materials into a cube.

### APPLICATION:

**Anticipatory Set: Science fiction Video of a giant cell taking in matter.**

**Students will create a (class / team product):** Students to investigate cell size and limitations through a mini science lab and create a table.

**Mathematics/Science Link and/or Humanities Link:** Determine how surface area and volume are related. (Direct relationship vs. Inverse)

**School-to-Career/Tech Prep Link:** Guest speaker-Florist to discuss techniques used to color flowers.

### HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Teacher demonstrates how pliable human skin is by bending arms and fingers, and pulling on skin. Show that a pencil can't bend and that it will break.

**Students will:** Compare the parts of a cell responsible for importing matter into a plant cell vs. an animal cell.

### INDIVIDUAL JOURNAL ASSIGNMENT:

The skin is also made up of cells, explain how materials get in and out of the body through skin cells and how it forms a protective barrier against infection.

### HOMELINK:

Identify the process by which Carnations are dyed and explain the process in one paragraph.

STATE STANDARD # 5.5.12A 1 STUDENTS WILL BE ABLE TO Relate the structure of molecules to their function in cellular structure and metabolism.

ESSENTIAL QUESTION: How does the Universal Theme of **Communications** create mastery learning of essential concepts in this unit? State the essential concept(s) that this specific lesson will teach.

**ESSENTIAL QUESTION:**

## 3. COMMUNICATIONS

Textbook or Database: Glencoe Biology (textbook)

### KNOWLEDGE:

**Anticipatory Set:** Students to play a short game of charades to demonstrate non-verbal communication.

**Students will:** identify ways that organisms communicate non-verbally and how individual cells communicate non-verbally.

**Formative Assessment:** oral review.

### COMPREHENSION:

Students to teach other students about 3 ways that cells communicate with each other.

### APPLICATION:

**Anticipatory Set:** Listen to a clip of the song "Let's Talk About It" by Jerry Lee Lewis.

**Students will:** Create their own code using symbols to communicate understanding.

**Multicultural and/or ESL and/or Bilingual Link:** Use the hieroglyphics to translate a sample message.

**Mathematics/Science Link and/or Humanities Link:** Have students look at codes of WWII and see how mathematics was used.

**School-to-Career/Tech Prep Link:** Neurologist

**Students will create a (class / team product):** Hieroglyphics

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Listen to “Pinky and the Brain” Theme Song, “Where did you get that Vibe?”

**Students will:** Create a map of a nerve cell with a legend explaining its components and actions.

INDIVIDUAL JOURNAL ASSIGNMENT:

Explain how the structure of a cell membrane leads to the function of communication.

HOMELINK:

Find three disorders which affect the communication between cells.

STATE STANDARD # 5.5.12 A4 STUDENTS WILL BE ABLE TO Relate disease in humans and other organisms to infections or intrinsic failures of a system.

ESSENTIAL QUESTION: How does the Universal Theme of **Protecting and Conserving** create mastery learning of essential concepts in this unit? State the essential concept(s) that this specific lesson will teach.

#### **4. PROTECTING AND CONSERVING**

Textbook or Database: Glencoe Biology (textbook), cellsalive.com, video-Body Story

KNOWLEDGE:

**Anchoring Activity / Anticipatory Set:**

Students to watch video – Body Story (NOVA) showing the path a virus takes in order to enter a woman’s throat.

**Students will:** Discuss how they can prevent themselves from catching the flu virus through self-care techniques.

COMPREHENSION:

Students will be able to predict what substances will flow freely through a cell membrane and which will not. Students will also predict how white blood cells find infection in the body

APPLICATION:

**Anticipatory Set:** View the clip from “Star Wars” where the shield is over the star ship, and the bad guys can’t shoot them but the shield lets out trash.

**Students will:** Construct a mobile with the cell in the center and a cellophane membrane around it have things inside and outside of the membrane that pass freely, have things outside the membrane that don’t pass freely.

**Multicultural and/or ESL and/or Bilingual Link:** Relate, in writing, the differences and similarities of a cell membrane and international borders.

**Mathematics/Science Link and/or Humanities Link:** Do houses in different climates use different roofs (membranes).

**School-to-Career/Tech Prep Link:** Speaker-school nurse to discuss proper hand washing techniques and other methods of protecting one’s self during flu season.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anchoring Activity / Anticipatory Set:** View a short clip of the movie “Outbreak.”

**Students will:** Students will discuss methods that viruses use to spread from one host to the next.

**Class/team/individual product:** Students will create a pamphlet warning consumers of the effects of a specific infectious agent, how the disease is transmitted, prevention, possible cures, and current advances in medicine related to that area.

INDIVIDUAL JOURNAL ASSIGNMENT:

Discuss your memory of a time in your childhood when you came down with an infection and discuss how it affected your life.

HOMELINK:

Share previously create pamphlet with family members.

STATE STANDARD #**5.2.12 B 1** STUDENTS WILL BE ABLE TO Examine the lives and contributions of important scientists who affected major breakthroughs in our understanding of the natural and designed world.

ESSENTIAL QUESTION: How does the Universal Theme of **Providing Education** create mastery learning of essential concepts in this unit?

**ESSENTIAL QUESTION:**

**5. PROVIDING EDUCATION**

Textbook or Database: Glencoe Biology (textbook), biologygmh.com (database).

**KNOWLEDGE:**

**Anticipatory Set:** Video-NOVA Galileo, to discuss how Galileo’s determination to change people’s opinion and dispel myths about nature resulted in his banishment from society.

**Students will:** discuss instances where telling the truth or doing the right thing has gotten them in trouble.

**Formative Assessment:** Observation of student interaction.

**COMPREHENSION:**

Students to read essay on how advancement in microscope technology contributed to the development of the cell theory.

Short-term / Cumulative Assessment: Pretend you are microscopic and can travel in the bloodstream, what would you see? Draw and label diagram.

**APPLICATION:**

**Anticipatory Set:** Outbreak video clip where monkey bites the scientist.

**Students will: study the discoveries of Frederick Griffith (1928) and Oswald Avery (1944) that led to the finding that DNA is genetic material.**

**Formative Assessment / Rubric for Product:** Discussion – how has the discovery of DNA affected our lives today?

**Multicultural and/or ESL and/or Bilingual Link:** Review the contributions African American/Hispanic scientists to our knowledge of the cell-create in class bulletin board featuring information.

**Mathematics/Science Link and/or Humanities Link:** Some scientists are known for their scientific endeavors as well as their literary skills. Review the literary work of a famous scientist who was involved in the scientific revolution.

**School-to-Career/Tech Prep Link:**

**HIGHER ORDER THINKING SKILLS (H.O.T.S.):**

**Anchoring Activity / Anticipatory Set:** Listen to song “Respect” by Aretha Franklin.

**Students will:** Respect the contribution/work of individual scientists who contributed to the development of the cell theory.

**Class/team/individual product:** Oral presentation using posters, models, etc. demonstrating the work of those who contributed to the development of the cell theory.

**INDIVIDUAL JOURNAL ASSIGNMENT:**

If you could go back in time what scientist would you like to meet and bring back to the future?

HOMELINK:

Discuss with family members the pros and cons of a scientific discovery.

STATE STANDARD # **5.2.12 B 2** STUDENTS WILL BE ABLE TO Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.

ESSENTIAL QUESTION: How does the Universal Theme of **Making and Using Tools and/or Technology** create mastery learning of essential concepts in this unit? State the essential concept(s) that this specific lesson will teach.

**ESSENTIAL QUESTION:**

## **6. MAKING AND USING TOOLS AND/OR TECHNOLOGY**

Textbook or Database: Glencoe Biology (textbook), cellsalive.com, and biologygmh.com

### **KNOWLEDGE:**

**Anticipatory Set:** From website cellsalive.com, show on screen materials found on the head of a pin.

**Students will:** Use flash cards to review the parts of a compound light microscope.

### **COMPREHENSION:**

*Short-term / Cumulative Assessment:* Students will demonstrate proper microscope techniques through drawing and labeling materials objects found in their environment that were viewed under the microscope and create a data table of findings.

### **APPLICATION:**

**Anticipatory Set: Power Point** Presentation depicting photomicrographs made using electron microscopes.

**Students will create a (class / team product):** In pairs students will create 3D models of objects observed using electron microscopes. Each student will take turns explaining the difference between compound light microscopes, and electron microscopes, their uses, and why the images look different.

**Multicultural Link:** Students to review prefixes and suffixes used in biology and how they relate to the study of cells.

**Mathematics Link:** Students to calculate the magnification of various microscopes.

**School-to-Career/Tech Prep Link:** Technology representative.

### **HIGHER ORDER THINKING SKILLS (H.O.T.S.):**

**Anchoring Activity / Anticipatory Set:** Video-National Geographic's Visualizing Cells.

**Students will:** Compare and contrast structure and function of various types of cells.

**Class/team/individual product:** Students to create a class web page to be used as a means of review. Web page will contain puzzles and games created by individual students.

### **INDIVIDUAL JOURNAL ASSIGNMENT:**

If you could be any cell you wanted to be, what type of cell would you choose? Explain your answer.

### **HOMELINK:**

Encourage family members to visit class website.

STATE STANDARD #: 5.2.12B2 STUDENTS WILL BE ABLE TO: Discuss significant technological achievements in which science has played an important part as well as technological advances that have contributed directly to the advancement of scientific knowledge.

ESSENTIAL QUESTION: How does the Universal Theme of **Providing Recreation** create mastery learning of essential concepts in this unit? State the essential concept(s) that this specific lesson will teach.

**ESSENTIAL QUESTION:**

## **7. PROVIDING RECREATION**

Textbook or Database: Glencoe Biology (textbook), cellsalive.com, and biologygmh.com

### **KNOWLEDGE:**

**Anticipatory Set:** Gattica video clip, scene where genetically perfect humans are considered the elite class and were given power and privilege.

**Students will:** Discuss how genetically altered humans would change sports (e.g., football, Olympics).

### **COMPREHENSION:**

Students will: Give examples of which sports would be most affected and least affected and why (e.g., football-run faster, fishing-a learned skill).

#### APPLICATION:

**Anticipatory Set:** Video ‘The Man Whose Arm Exploded,’ Discovery Channel.

**Students will create a (class / team product):** Students will the effects of steroids on the human body, particularly on adolescent health.

**Formative Assessment / Rubric for Product:** Students will be assigned to two opposing groups in order to debate the pros and cons of steroid use among athletes.

**Multicultural Link:** : In the Olympics, if genetic engineering was allowed, how would developing countries suffer, as opposed to developed countries?

**Mathematics Link:** Study about the Greek god, Heimes.

**School-to-Career/Tech Prep Link:** Interview a sports medicine physician/orthopedic surgeon as to how they correct/enhance genetic traits of athletes

#### HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anchoring Activity / Anticipatory Set:** Song, ‘‘Feel So High,’’ by Des’re.

**Students will:** Compare and contrast blood doping and juicing.

**Class/team/individual product:** Students will create a prototype of the perfect genetically altered team.

#### INDIVIDUAL JOURNAL ASSIGNMENT:

State your opinion of steroid use by athletes.

#### HOMELINK:

Share pamphlet with family members and discuss steroid use.

STATE STANDARD # 1d STUDENTS WILL BE ABLE TO the Central Dogma of molecular biology outlines the flow of information from transcription of RNA in the nucleus to translation of proteins on ribosome’s in the cytoplasm.

ESSENTIAL QUESTION: How does the Universal Theme of **Organizing and Governing** create mastery learning of essential concepts in this unit?

### **8. ORGANIZING AND GOVERNING**

Textbook or Database: Biology text – DNA and genes

#### KNOWLEDGE:

**Anticipatory Set:** a clip from Gattaca

**Students will:** - understand the relationship between DNA, RNA, and mRNA and proteins and cell structure

#### COMPREHENSION:

Students should design a model of a transcription site, and write out how information gets passed on from DNA to a protein.

#### APPLICATION:

**Anticipatory Set:** to be or not to be..... that is the question.

**Students will:** differentiate between the functions of and RNA

**Class/team product:** build a model of a specific DNA sequence and its corresponding RNA sequence, and will demonstrate how a protein is made.

**Multicultural and/or ESL and/or Bilingual Link:** Har Gobind Khorana, Indian-American biochemist. Find out when he came to America and why.

How many countries in the world are presently working on the human genome project, and how are all the countries communicating their findings with one another??

**Mathematics/Science Link and/or Humanities Link:** Discuss geometry of a DNA molecule. What is parallel? Is it symmetrical? Explain.

**School-to-Career/Tech Prep Link:** Human Genome Project.... Lotta money in that business. Blue rose millionaire.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** clip of a supermarket commercial (seedless watermelons)

**Students will:** come up with an idea of a genetically altered product that the common man would buy and use.

**Class/team/individual product:** Present a genetically altered product that would sell in the market today, along with pro's and cons and producing it.

INDIVIDUAL JOURNAL ASSIGNMENT:

Do you think genetically altered produce are good or bad for healthy living??

HOMELINK:

Look in your fridge. How many genetically altered products do you think consume in a week?

STATE STANDARD # \_\_\_\_\_ STUDENTS WILL BE ABLE TO \_\_\_\_\_.

ESSENTIAL QUESTION: How does the Universal Theme of **Moral, Ethical and Spiritual Behavior** creates mastery learning of essential concepts in this unit? State the essential concept(s) that this specific lesson will teach.

**ESSENTIAL QUESTION:**

**9. MORAL, ETHICAL AND SPIRITUAL BEHAVIOR (Biology Text)**

KNOWLEDGE:

**Anticipatory Set:** Read poem "I Really Hate My Hair" by Shel Silverstein

**Students will:** Define the terms: bioethics, morality, ethics

COMPREHENSION:

Write an essay explaining why bioethics is an important scientific and governmental issue in our society today. (or make a cartoon strip)

APPLICATION:

**Anticipatory Set:** Read Newsweek's argument about cloning.

**Students will:** Create a survey to find out how someone feels about cloning and genetic enhancement (bioethics).

**Class/team product:** Survey 5 adults and 5 students to find out their opinions regarding their bioethical views.

**Multicultural and/or ESL and/or Bilingual Link:** Explore religions to find out which ones are doctrinally opposed to genetic engineering, which are supportive, and which take no stand.

**Mathematics/Science Link and/or Humanities Link:** Graph bioethics survey results.

**School-to-Career/Tech Prep Link:** Have a sociologist speak to the class about how society's influence affects scientific technology and advancement.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Read June 2002 Natural History article—Oliver Wendell Holmes—sterilization after the third generation of retardation.

**Students will:** list circumstances where genetic engineering would be appropriate and circumstances where it would be inappropriate.

**Class/team/individual product:** Write a new law which outlines under which conditions human prenatal genetic enhancement would be legal. Include safeguards so scientists cannot "play God" in situations where you think this would be inappropriate.

INDIVIDUAL JOURNAL ASSIGNMENT:

Should genetic counselors try to influence families' decisions to have children? Why or why not?

HOMELINK:

Ask your parents if they would have still tried to have children if they knew ahead of time that there was a 25% chance for a genetic abnormality. A 50% chance? 75%?

ESSENTIAL QUESTION: How does the Universal Theme of Aesthetic Needs create mastery learning of essential concepts in this unit? State the essential concept(s) that this specific lesson will teach.

**ESSENTIAL QUESTION:**

## 10. AESTHETIC NEEDS

### KNOWLEDGE:

**Students will:** explore the beauty of living organisms and the influence they have on art.

**Anticipatory Set:** Show a series of stained bacteria cells while playing Claude DeBussy, (Impressionistic music) in the background.

**Students will:** Describe orally their opinion of the bacteria slides to other students who can not see the slides. Groups will be placed in layers with only the inner layer being able to see the slide. Students will rotate from the inside out after the slide.

### COMPREHENSION:

Using assorted beans that show the different parts of a cell, students will construct a mosaic and then explain its relation to a cell.

### APPLICATION:

**Anticipatory Set:** Watch the ending clip of the animated movie “Beauty and the Beast”.

**Students will:** Create a piece of impressionistic art inspired by pictures of cells. Use a piece of black or white drawing paper and sidewalk chalk to create the drawing. Play DeBussy or Warren classical music during the “art” session.

**Multicultural and/or ESL and/or Bilingual Link:** Locate as many different foreign language pronunciations for the word “cell.”

**Mathematics/Science Link and/or Humanities Link:** Look at stained slides of plant cells, and identify any symmetric patterns.

**School-to-Career/Tech Prep Link:** Artist

### HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anticipatory set:** Play “You Must Have Been a Beautiful Baby” by Bobby Derrick.

**Students will:** Exchange your art pictures with another person in the class. Describe it, and tell ten good things about it. Try to figure out the influence of the picture.

### INDIVIDUAL JOURNAL ASSIGNMENT:

In your opinion, what is considered beautiful here in the U.S., and also considered beautiful in Africa.

### HOMELINK:

Think of ten ways this lesson has helped you.

STATE STANDARD # 5.5.12 STUDENTS WILL BE ABLE TO understand the passing of traits where the Science of DNA fits into Forensic Studies and Law

### ESSENTIAL QUESTION:

How does the discipline/sub-discipline of DNA relate to mastery learning of Forensic Studies. State the essential concept(s) that this specific lesson will teach.

### **ESSENTIAL QUESTION:**

How can the analyzing of blood cells lead to the exoneration of accused perpetrators.

## 11. Social Studies

Textbook or Database :Biology (Textbook-Glencoe), Cellsalive (database)

### KNOWLEDGE:

**Anchoring Activity / Anticipatory Set:**

Students will: will examine prepared slides of different DNA samples to determine which matches the suspect. Observe how a Blue or Ultra violet light will pick up visible cell evidence when treated with stain..

**Formative Assessment:** Direct observation and completing a T Chart

**COMPREHENSION:**

*Short-term / Cumulative Assessment:* Students by observing cell slides of DNA will be able to visually see the criteria for a match or no match. They will each observe the two different slides through their microscope and see first hand the count or parameters that a Forensic Scientist would experience

**APPLICATION:**

**Anchoring Activity / Anticipatory Set:** Since we are all the same, yet different as human beings, why is the big deal about being different? Why would a genetic difference such as hair or eye color make a person so emotional that you could hate or at least avoid contact with?

View several clips from CSI shows- Las Vegas, Miami and New York.

**Students will create a (class / team product):** Students will create “A Child’s ID Kit”. In addition to a card listing important info- DOB, color of hair, eyes, scars, blood type, fingerprints and picture, the kit will also include a capsule of several strands of hair for DNA identification.

**Formative Assessment / Rubric for Product:** Students will have learned that fingerprints and DNA are positive identifying factors of missing persons.

**Multicultural and/or ESL and/or Bilingual Link:** DNA and blood factors are different for different nationalities – Jewish, Sickle cell anemia, iron deficiencies in certain areas of the world. Discuss if any of the students are aware of these or have them.

**Mathematics/Science Link and/or Humanities Link:** Students will read about Sickle Cell anemia and why a crescent shaped cell will carry less oxygen in the bloodstream..

**School-to-Career/Tech Prep Link:** Students will research the careers of phlebotomists and forensic scientists

**HIGHER ORDER THINKING SKILLS (H.O.T.S.):**

**Anchoring Activity / Anticipatory Set:** Show tech video of phlebotomists at work.

**Class/team/individual product:** Display on overhead or smart board side by side slides of different DNA’s or regular blood cell and one with sickle cell anemia. Have students observe, compare and contrast and why do they think in causes problems?

**Summative Assessment:** Students will be able to have a better understanding as a result of this-hands on demonstration.

**INDIVIDUAL JOURNAL ASSIGNMENT:**

Why do you think that DNA markers are individual identifiers that make us unique?

**HOMELINK:**

Why do you think that DNA markers are individual identifiers that make us unique?

STATE STANDARD # 5.512 C3 STUDENTS WILL BE ABLE TO determine and understand degree of relatedness among individuals.

How does the discipline/sub-discipline of Biology relate to mastery learning of cells and cell division? State the essential concept(s) that this specific lesson will teach.

**ESSENTIAL QUESTION:**

How is the difference in humans determined and why is there such differences and similarities?

**12. SCIENCE**

Textbook or Database: Biology - Glencoe

**KNOWLEDGE:**

**Anchoring Activity / Anticipatory Set:** Students will observe clips of “Parent Trap” and “Twins” to show the difference in fraternal and identical twins.

**Formative Assessment:** Students will be able to view the obvious differences and from their readings (text) will be able to discern the Scientific reasons for the differences.

#### COMPREHENSION:

Students will explain how an egg (cell) is divided, mutated and fertilized etc thus proving how we have differences in twins, mutations ,genetic variations.

**Short-term / Cumulative Assessment:** At first look it is simple to see sameness or differences in viewing people, but leads to a more burning question of survival of fittest, adaptation of animals (chameleon, polar bears, arctic hare).

#### APPLICATION:

**Anchoring Activity / Anticipatory Set:** Have students discuss and demonstrate how humans and animals adapt to survive- some by blending in, or no obvious difference- one of a hundred etc. by showing pictures of twins, polar bears and arctic foxes in their snowy environment

**Students will create a (class / team product):** Have students create a mural with the adaptive animals hidden in the mural and try to find them or a poster of 50 similar characters and only two are the same ala “Find Waldo”.

**Formative Assessment / Rubric for Product:** The students will be successful if they can identify the “same” characters and all of the hidden animals.

**Multicultural and/or ESL and/or Bilingual Link:** Have students determine if animals in certain areas that are on the verge of extinction and why ?

**Mathematics/Science Link and/or Humanities Link:** Students can read excerpts Mark Twain’s “ The Prince and The Pauper” .

**School-to-Career/Tech Prep Link:** Arrange for a geneticist to speak before the class and explain what they do.

#### HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anchoring Activity / Anticipatory Set:** Play and sing the song “We are the World” or “I Would Like To Teach the World to Sing”.

**Students will:** Brainstorm as a class by listing on board all characteristics that they can think of that makes us different. Of these are the traits which are inherited? Hair, color and texture, and eye, shape, color and vision acuity. Thick /thin, straight, curly hair, Freckles, Buck teeth, sugar diabetes, cancers etc

**Class/team/individual product:** Create a figure that encompasses as many possible traits as you can label. Decide whether they are genetic, dominant recessive are phenotype.

**Summative Assessment:** Determine whether students understand concept by identifying characteristics and stating how they are passed on.

#### INDIVIDUAL JOURNAL ASSIGNMENT:

Make a list of traits you think you inherited, whether you like them or not and what you like to pass on to your children.

#### HOMELINK:

Have family members share with you characteristics of family members, eyes like your grandmother, hair like aunt and teeth like great grand father.

### 13. Mathematics

Textbook or Database: Biology Glencoe

#### KNOWLEDGE:

**Anchoring Activity / Anticipatory Set:** View clips of Video Gattica and the Boy in the Plastic Bubble

**Students will:** Students will compare and contrast Gattica where you have to be perfect to emerge on Moon’s surface and the Boy in the Bubble where he cannot be exposed to ordinary environmental conditions.

#### COMPREHENSION:

If we had gene altering and we could eliminate cancer or choose to have perfect babies how do you think it would change our society? What happens if it turns out that you like those choices- then what do you do?

#### APPLICATION:

**Anchoring Activity / Anticipatory Set:** View video clips of Cocoon and 101 Dalmatians

**Students will create a (class / team product):** Research and predict what we consider old, when should people retire and do older people have any usefulness. On the other hand with Dalmatians and the continuous inbreeding the dogs have bad hearing and sight and cannot be sold. Should they be destroyed because genetics are not working.

**Formative Assessment / Rubric for Product:** Students can examine average ages of adults, retirement ages and decide if they think that is productive.

**Multicultural and/or ESL and/or Bilingual Link:** Some cultures revere their elderly read and review how China and Eskimo cultures treat their elderly.

**Mathematics/Science Link and/or Humanities Link Students will examine** how with gene altering a person may live indefinitely. Do we think this is a good idea. What would you do to change it or should we ignore science?

**School-to-Career/Tech Prep Link:** Talk to scientist and politicians to see if a debate over the morality and legality of altering genes.

#### HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anchoring Activity / Anticipatory Set:** Research Hitler's genetic engineering what is the difference of the end product? Did it affect our society and or values? View clip Boys From Brazil and The Bionic Woman Is altering genes or mechanical body parts that much different?

**Class/team/individual product:** Write a paper on what it would be like if you could choose you perfect body, and live as long as you want without fear of disease, what would you life would be like if everybody could do this?

#### INDIVIDUAL JOURNAL ASSIGNMENT:

If you could save someone you cared for live by having your genes transplanted to their body, would you do it? When you are able to legally sign, would you become a organ donor?

#### HOMELINK:

Has anyone in you family received or signed up to be donor (organ, sperm, egg, gene, marrow)? Why or Why not.

STATE STANDARD # 5.512A STUDENTS WILL BE ABLE TO appreciate Fine Arts and culture and they "stem" from Science.

How does the discipline/sub-discipline of fine Arts relate to mastery learning of genes and "Beauty" State the essential concept(s) that this specific lesson will teach.

#### **ESSENTIAL QUESTION:**

Is Beauty skin deep or only in the eyes of the beholder? How does cell make up change facial structure, skin coloring and diet. Does geography and climate have anything to do with it?

#### **14. Humanities/Literature**

Textbook or Database: Biology (Glencoe)

#### KNOWLEDGE:

**Anchoring Activity / Anticipatory Set:** Hunchback of Notre Dame and Beauty and the Beast film clips- human and cartoon depictions of handicapped disfigured characters.

**Students will:** Compare and contrast the two. Is there a common thread? What do they mean by perfect (10)?

**Formative Assessment:** What is Beauty? What do you consider beautiful?

#### COMPREHENSION:

Give at least items that you consider to have beauty- pictures, models, nature, etc and defend your choices.

**Short-term / Cumulative Assessment:** Brainstorm on smart board qualities that describe "Beauty".

#### APPLICATION:

**Anchoring Activity / Anticipatory Set:** From a list of poems and or master paintings pick one of each and describe it's "beauty"

**Students will create a (class / team product):** Students will create their own object of beauty - painting , car, poem etc. and create a campaign to market it as a thing of beauty and therefore in demand..

**Multicultural and/or ESL and/or Bilingual Link:** Why do you think that there are more museums in Europe ? Is that mean Europe has more "Beauty of love of it"?

**Mathematics/Science Link and/or Humanities Link:** Do you think an artist or writer creates for a reason or for the sheer beauty of it!

**School-to-Career/Tech Prep Link:** Have Language and Fine Arts staff talk to students regarding Beauty and what they as professionals look for.

#### HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anchoring Activity / Anticipatory Set:** Students will examine Siberian natives, eskimoes, American Indians, Mexican natives Aztec and Inca relative. Utilizing your visualization skills compare these peoples and find similarities and differences and determine if there is any common Beauty?

**Class/team/individual product:**

**After the anticipatory Set** students will vote on who they think is the most beautiful- based on facial, hair color etc.

#### INDIVIDUAL JOURNAL ASSIGNMENT:

Create an entry expressing your beliefs of what beauty entails. And write about the most beautiful thing you have experienced and why!

#### HOMELINK:

Ask family members what was the most beautiful object that they have ever seen and describe it.

STATE STANDARD #5.2.12 A 1STUDENTS WILL BE ABLE TO understand where the Science of DNA fits into Forensic Studies and Law

#### ESSENTIAL QUESTION:

How does the discipline/sub-discipline of Fine Arts relate to mastery learning of genes and beauty? State the essential concept(s) that this specific lesson will teach.

#### **ESSENTIAL QUESTION:**

#### **15. Fine Arts Database**

Textbook or Database:

#### KNOWLEDGE:

**Anchoring Activity / Anticipatory Set:** Show film clips of Ten and Shrek

**Students will:** View and contrast the videos the Beauty of Bo Dereck and Ugliness of Shrek. This leads to a discussion of the technical aspects of making the films. The slow mo and animation give rise questioning about why theme was chosen.

**Formative Assessment:** Students will learn from database and texts. The obvious will amusement and entertainment.

#### COMPREHENSION:

*Short-term / Cumulative Assessment:* Students will infer the reason for movies like those viewed. Double helix

#### APPLICATION:

**Anchoring Activity / Anticipatory Set:** Double helix of DNA and tie in with The Geometry of Life or Science Mimics Nature.

**Students will create a (class / team product):** Students will with the help of Jewelry Teacher try to create the Double Helix in Jewelry class and or paint geometric shapes that are common in nature for an art exhibit in school

**Formative Assessment / Rubric for Product:** Since the DNA is a model of life see if any guests at the art show made comments regarding the "Life" in the exhibit.

**Multicultural and/or ESL and/or Bilingual Link:** Have students research the term helix find root, and origin. Why do you think they used that language ofr this term.

**Mathematics/Science Link and/or Humanities Link:** Students will review the geometric figures and determine if they are familiar the shapes used in geometry?

**School-to-Career/Tech Prep Link:** Have a medical illustrator address the class.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anchoring Activity / Anticipatory Set:**

**Students will:** examine jewelry catalogues to see how many pieces are copied after the Helix

**Class/team/individual product:** class will erect a larger than life DNA helix using colored paper to for enhancement

**Summative Assessment:**

INDIVIDUAL JOURNAL ASSIGNMENT:

Research papers for articles dealing with DNA testing and police cases.

HOMELINK:

Has anybody in our family hade genetic testing done?

STATE STANDARD #5.2.12 A 1STUDENTS WILL BE ABLE TO understand where the study of cells fits into physical Education.

**ESSENTIAL QUESTION:**

ESSENTIAL QUESTION:

How does the discipline/sub-discipline of Physical Education relate to mastery learning of cellular biology? State the essential concept(s) that this specific lesson will teach.

**16. Physical Education**

Textbook or Database: Biology (Glencoe)

KNOWLEDGE:

**Anchoring Activity / Anticipatory Set:** Ten video clip Bo running on the beach- physical fitness and Bobby Darin sing You Must Have Been A Beautiful Baby.

Students will explain about their Physical fitness and hygiene tips

**Formative Assessment:** participation in discussion o

COMPREHENSION:

Defend the need for endurance enhancements list various activities and put them into 2 categories aerobic and anaerobic

**Short-term / Cumulative Assessment:** Define and list the above categories.

APPLICATION:

**Anchoring Activity / Anticipatory Set:** Show clips of Rocky and Chariots of Fire and show how the different types of running are similar in make up.

**Students will create a (class / team product):** The class will be divided into 2 halves and students will each do a type of exercise and the take their heart rate which is more efficient

**Formative Assessment / Rubric for Product:** Students will observe their rates and decide what type of exercise causes the rate to rise.

**Multicultural and/or ESL and/or Bilingual Link:** Discuss Chariots of fire and the early Olympics

**Mathematics/Science Link and/or Humanities Link:** Graph the daily exercise time and heart rate

**School-to-Career/Tech Prep Link:** Have a personal trainer and dietician speak with students

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anchoring Activity / Anticipatory Set:** Play the Song Physical, Bolero and theme from Chariots of Fire and discuss how the tone instill the desire to exercise.

**Students will:** Students will participate in an exercise tape

**Class/team/individual product:** students will create their own exercise tape – dancing for the upperclassmen.

**Summative Assessment:**

INDIVIDUAL JOURNAL ASSIGNMENT:

If you do not have one, create a health regime and follow it for one month.

HOMELINK:

Discuss with family members the importance of healthy living including diet and exercise.

STATE STANDARD # 5.2.12b2 STUDENTS WILL BE ABLE TO understand the concept of genetic experimentation

ESSENTIAL QUESTION:

How does the discipline/sub-discipline of computers relate to mastery learning of cellular biology? State the essential concept(s) that this specific lesson will teach.

**ESSENTIAL QUESTION: What is the use of technology in cellular biology?**

**17. Vocational/Technical Arts**

Textbook or Database: Biology (Glencoe)

KNOWLEDGE:

**Anchoring Activity / Anticipatory Set:** Jurassic Park Race for Double Helix view the clips

**Students will:** Examine the clips for specific uses of computer

**Formative Assessment:**

COMPREHENSION:

Examine primary research as to the use of computers in cellular research

*Short-term / Cumulative Assessment:* Students will be able to defend the importance of modern technology in doing the research as opposed to the fruit flies.

APPLICATION:

**Anchoring Activity / Anticipatory Set:** Continuation of Race for Double Helix where they mix Human and extraterrestrial DNA's

**Students will create a (class / team product):** Students will look for examples as shown in Jurassic Park where the computer completes the strains. Could and does this happen in real life.

**Formative Assessment / Rubric for Product:** Examine and research how many scientific discoveries may have been by mechanical investigation.

**Multicultural and/or ESL and/or Bilingual Link:** Determine how different religions and culture react to genetic testing and cloning.

**Mathematics/Science Link and/or Humanities Link:** Create a list of technological machines tools that have assisted scientists to engage in cloning and genetic forecasting.

**School-to-Career/Tech Prep Link:** Have a variety of DP people talk to students regarding opportunities in the field

HIGHER ORDER THINKING SKILLS (H.O.T.S.):

**Anchoring Activity / Anticipatory Set:** View the Lorenzo's Oil clip

**Students will:** discuss health care regarding genetic experimentation. Designer babies, cloning body organs etc

**Class/team/individual product:** design a health care plan that is aided by computer for gene splicing, genetic planning, designer babies and how would companies and or Government pay for it.

INDIVIDUAL JOURNAL ASSIGNMENT:

Do you think you would ever fall in love and have a relationship with someone who was cloned?

HOMELINK:

Has anyone in the family ever received donated organ?

**MORAL / ETHICAL / SPIRITUAL  
REASONING AND DILEMMAS  
FOR CHARACTER EDUCATION**

**TEN ETHICAL DILEMMAS**

*(Must be set in context of unit, but must also relate to the lives of today's students)*

STATE STANDARD # \_\_\_\_\_.

ESSENTIAL QUESTION: How does the content of this unit reflect **character education** through Moral and Ethical dilemmas?

1. **Producing, Exchanging, and Distributing** [Economics]

ESSENTIAL QUESTION: How does the **Human Activity** of **Producing, Exchanging and Distributing** create moral/ethical dilemmas?

**DILEMMA:** You are a young married Chinese Couple who are much in love and two beautiful children 1 girl and 1 boy. You are also both loyal Party members and want to be loyal to the government. You find out you are expecting a third child which is contrary to party rules. Do you secretly hope for another boy, or another girl? Do you proceed to have your child regardless, or at the very least inform the government and let them inform you of the decision?

**DILEMMA:** Sally has ADHT. Sally and her friend have been studying all night. They are extremely exhausted. You have a final in cell biology tomorrow. Their grades in this class will be calculated in your college G.P.A. Their final is in four hours. Knowing that medical side effects of overdosing on Adderol ( used for kids with ADHT) is similar to speed, should the friend ask Sally for a pill to keep her energy up for the test? Should Sally take an extra dose??

2. **Transportation**

ESSENTIAL QUESTION: How does the **Human Activity** of **Transportation** create moral/ethical dilemmas?

**DILEMMA:** We have studied the pliability of skin and you know that it can stretch. Would you think it is humanly possible for the skin to stretch so much that so that it can break? Could you possibly overeat or drink too much to break your skin? How about a woman carrying quintuplets?

**DILEMMA:** You are fifteen; you don't have your license to drive yet. However, you know how to drive. You are leaving a party. Your friend is drunk, and offers you the keys to the car. What do you do???

3. **Communications**

ESSENTIAL QUESTION: How does the **Human Activity** of **Communications** create moral/ethical dilemmas?

**DILEMMA:** You are on a surgical team and have discovered nerve damage in one of your patients. As a professional you are aware that there are three possible disorders to the cell that will contribute to and affect communication between cells. You have isolated 2 of the three disorders. To search for the third may cause irreparable harm. Do you seek the third cause, locate it and have the patient suffer much pain, or do you tell the patient that nothing else can be done and just endure it.

**DILEMMA:** Your friend is bulimic. You know that bulimia causes tooth decay, as well as problems with the esophagus and stomach. You confront her on it. She says she realizes that she has a problem and that she just needs time to deal with it. She begs you not to tell anyone. Two months later, you catch throwing up in the school bathroom. She still hasn't done anything to help herself. How do you deal with the situation?

4. **Protecting and Conserving**

ESSENTIAL QUESTION: How does the **Human Activity** of **Protecting and Conserving** create moral/ethical dilemmas?

**DILEMMA:** Your girlfriend put together a Public Service Announcement pamphlet about "Virus Transmission" as part of her Biology Class. You read it especially the part about being tested for viral transmissions. You decided to be tested and found out that you are HIV positive. By law you have to inform all your sexual partners. If you do this, she will know that you weren't faithful. You feel that this is your problem and she probably didn't get from you, so you decide not to tell her. Beside you have to live with this problem. Do you agree with this decision and what would you do?

**DILEMMA:** Babies are born every minute of the day. Some of these babies are born with some kind of developmental defect. If you just found out that the fetus in your womb would be born with a developmental defect, would you abort? Is mercy abortion a viable solution? Is it fair to regulate a human to a lifetime of being different?

#### 5. Providing Education

ESSENTIAL QUESTION: How does the **Human Activity** of Providing Education create moral/ethical dilemmas?

**DILEMMA:** As admirers of beauty and form we think of our models as pure and natural. In reality they have botox injections, tummy tucks, breast enlargement or reductions, liposuction etc. Do you think as a representative of art they have an obligation to let the public know what work they have had done. Should we know? Should they tell? Explain your feelings in depth.

**DILEMMA:** Contraception is a term used often in sex education. Contraception has many different faces. Your school wants to offer a class on sex education. As one of the activities offered in this class is the distribution of condoms. I don't agree! Do I pull my child out of this class? And do I teach my child sex education the way I see it being taught?

#### 6. Making and Using Tools and/or Technology

ESSENTIAL QUESTION: How does the **Human Activity** of Making and Using Tools and/or Technology create moral/ethical dilemmas?

**DILEMMA:** You are working as a CSI and are responsible for analyzing DNA taken from a crime scene. In examining the DNA it appears that the specimen may be contaminated. This confirmed by another technician that he ran out specimen containers and had to use one over, but all the other evidence, 99%, will convict, so what is the big deal? If you throw it out, the perp will walk. What would you do?

**DILEMMA:** Scientists have found a way to remove stem cells from a live fetus. These stem cells can regenerate dead tissue and develop a defective area back to normal. Is it right to abort a fetus for these miraculous cells? Many famous people who are quadriplegics, or have Alzheimer's, would pay tremendous amounts for these cells. Should we do it for them?

#### 7. Providing Recreation

ESSENTIAL QUESTION: How does the **Human Activity** of Providing Recreation create moral/ethical dilemmas?

**DILEMMA:** Bobby Bonds has broken baseball home run record and he claims he hasn't used any stimulants or steroids, yet several of his teammates claim he has. The ball has just been donated to Base Ball's Hall of Fame at Cooperstown. Sentiment is that there should be an asterisk stating the hitter was suspect of using enhancers. Do you agree or disagree and why?

**DILEMMA:** You are a football player and want to be a star. The coach has implied that steroids might be a good alternative and can change your future. Your uncle died 3 years ago from cancer caused by long term use of steroids. What do you do?

#### 8. Organizing and Governing

ESSENTIAL QUESTION: How does the **Human Activity** of Organizing and Governing create moral/ethical dilemmas?

**DILEMMA:** You have studied gene engineering and discussed organ donations. Do you think the standards for donations should be more strict or relaxed? Consider a person sentenced to life in prison and needs a heart transplant. Should he be eligible to be on the list?

**DILEMMA:** You are a CEO of an insurance company. You are made aware that some clients are having genetic testing done for Huntington's Disease (a degenerative, fatal disorder affecting men and women in middle ages). As an insurance company you feel that it is your right to obtain the results of these genetic tests. After all, if a client has the gene for a Huntington's, you feel you shouldn't have to insure them because they will eventually die. You feel this way because the cost for their medical care would not equal what they are paying for their premiums. What are your thoughts on this?

#### 9. Moral, Ethical and Spiritual Behavior

ESSENTIAL QUESTION: How does the **Human Activity** of Moral, Ethical and Spiritual Behavior create moral/ethical dilemmas?

**DILEMMA:** Modern tech has made great strides in scientific explorations. In this light should we continue to push the envelope or do you think we have gone too far. Do people have the right to push or be bothered if they feel it contradicts their moral code?

**DILEMMA:** As adults, Siamese Twins (age 29), decide they want to be separated so they can lead separate lives. Doctors inform them that it is very risky, and one or both of them may die. Imagine you were one of the twins what would your thoughts be after hearing the risks? As a family member what might you advise them? As the doctor, would you agree to still operate on them knowing the risks?

**10. Aesthetic Needs**

**ESSENTIAL QUESTION:** How does the **Human Activity** of **Aesthetic Needs** create moral/ethical dilemmas?

**DILEMMA:** Since we are all the same, yet different as human beings, why is the big deal about being different? Why would a genetic difference such as hair or eye color make a person so emotional that you could hate or at least avoid contact with?

**DILEMMA:** Pre-Implantation Diagnosis (PID) is available by reproductive specialists. Should embryos with potential genetic disorders be allowed to be implanted into a woman? Should married couples be able to choose the sex of their child before birth? Should couples be able to choose specific traits that they want in their child? Are designer babies a thing of the future? Or is it actually happening in the world today?

<b>PRODUCTIVE THINKING SKILLS DIVERGENT / CREATIVE THINKING</b>
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1. **BRAINSTORM MODEL**

A. BRAINSTORM ALL OF THE \_\_\_\_\_.

- AHA #1: all the characteristics that make a person beautiful and or handsome
- AHA #2: things comprised of cells
- AHA #3: all the ways that people and things communicate
- AHA #4: the viruses that you know of and if all of them are bad
- AHA #5: germs that may cause disease
- AHA #6: "Beautiful" people that appeared on the covers "People" Magazine
- AHA #7: ways of calling attention to yourself

B. BRAINSTORM AS MANY \_\_\_\_\_ AS YOU CAN THINK OF.

- AHA #8: strands of DNA and RNA
- AHA #9: to change your physical appearance
- AHA #10: to portray beauty-paint, carve, music etc
- AHA #11: ways that a human being can be identified.
- AHA #12: characteristics of what you consider what makes a person beautiful or good-looking
- AHA #13: scientific professions that deal with cells-geneticist lab attendants etc.
- AHA #14: common features of the major races and ethnic groups of the world that are similar

C. HOW MANY WAYS CAN YOU COME UP WITH TO \_\_\_\_\_?

- AHA #15: "create" a Bionic person?
- AHA #16: describe a double helix- DNA model?
- AHA #17: eliminate physical handicaps?
- Random Brainstorm: is criminality a gene/cell disorder?
- Random Brainstorm: people change themselves- face lifts tummy tucks etc.
- Random Brainstorm: modern science makes our lives easier.
- Random Brainstorm: repair or replace the human heart.

2. **VIEWPOINT MODEL (Human or Animate) **USE CULTURAL LITERACY TERMS****

A. HOW WOULD \_\_\_\_\_ LOOK TO A(N) \_\_\_\_\_?

- AHA #1: sperm, giant redwood
- AHA #2: skin, tarpaulin
- AHA #3: Hieroglyphics, musical notation
- AHA #4: germs, disinfectant
- AHA #5: cancer cells, medicine
- AHA #6: white cells, open wound

AHA #7: bionic arm, football quarterback  
AHA #8: DNA molecule, geometric structure

B. WHAT WOULD A \_\_\_\_\_ MEAN FROM THE VIEWPOINT OF A(N) \_\_\_\_\_ ?

AHA #9: hair strand, flea

AHA #10: amoeba, human eye

AHA #11: clue

AHA #12: bionic person

AHA #13: cloned baby

AHA #14: cloned baby

AHA #15: Miss America

AHA #16: cross country course

AHA #17: electron microscope

CSI investigator

Track Coach

adoptive parents

Original parents

Blind person

infant

ant

C. HOW WOULD \_\_\_\_\_ VIEW THIS?

(Use one person from history here)

1: Geneticist view defective gene cells?

2: How would a parson with MD view Jerry Lewis?

3: How do people that have contracted cancer feel about being called survivors?

4: A physically challenged person called retarded

5: A CSI type watching person contaminate a crime scene?

6: Perpetrator watching a person contaminates a crime scene?

3. **INVOLVEMENT MODEL (Personification / Inanimate object brought to life)**

A. HOW WOULD YOU FEEL IF YOU WERE \_\_\_\_\_ ?

AHA #1: egg cell

AHA #2: flower

AHA #3: amoeba

AHA #4: virus

AHA #5: microscope

AHA #6: cell and could choose what type of cell you would want to be

AHA #7: steroid

B. IF YOU WERE A \_\_\_\_\_, WHAT WOULD YOU (SEE, TASTE, SMELL, FEEL, etc.)?

AHA #8: DNA molecule

be

AHA #9: hair follicle

feel

AHA #10: bacteria cell

taste

AHA #11: amoeba

see

AHA #12: twin

feel

AHA #13: organ donor

feel

AHA #14 : beauty model

act

C. YOU ARE A \_\_\_\_\_. DESCRIBE HOW IT FEELS.

AHA #15: famous painting

AHA #16 football hall Fame:

AHA #17 Mona Lisa

4. **CONSCIOUS SELF-DECEIT MODEL**

A. SUPPOSE \_\_\_\_\_. WHAT \_\_\_\_\_.

AHA #1: you were a Caucasian cell and you attached to a Afro-American body

AHA #2: you were a cell and you drove though a brain to see how much knowledge it possesses

AHA #3: what would you do if you cannot communicate with anyone?

AHA #4: suppose you were cell and you were forced to ingest illegal drugs

AHA #5: you are a Afro-American cell that finds the Sickle Cell anemia disease

AHA #6: as a cell travel though the body you inhabit and create a journal

- AHA #7: you were a steroid and you were injected into an athletes body  
 AHA #8: I am a DNA molecule and I think I am in the wrong body.  
 AHA #9: I am cloned and I become the most beautiful/handsome person in the world

B. YOU CAN \_\_\_\_\_ . WHAT \_\_\_\_\_ ?

- AHA #10: look at stained cell slides pieces. Kind of art would you find  
 AHA #11: become a sickle cell anemia cell would you discover what makes us different?  
 AHA #12: be a twin and feel differences can you anticipate feeling of your twin?  
 AHA #13: if you were an Eskimo who would you relatives be?  
 AHA #14: be beautiful is the quality that makes you beautiful?  
 AHA #15: be a famous painting would you do if a person throws paint remover on it?  
 AHA #16: Olympian athlete and your are accused of steroid abuse  
 AHA #17: be a long distance runner would you do if you pulled a muscle?

5. **FORCED ASSOCIATION MODEL** **USE CULTURAL LITERACY TERMS HERE**

A. HOW IS \_\_\_\_\_ LIKE \_\_\_\_\_ ?

- AHA #1: conception wheel of fortune?  
 AHA #2: cell swimmer  
 AHA #3: cell antennae dish  
 AHA #4: Virus friendship  
 AHA #5: microscope door  
 AHA #6: cancer slide  
 AHA #7: steroid body builder

B. GET IDEAS FROM \_\_\_\_\_ TO IMPROVE \_\_\_\_\_ .

- AHA #8: sperm cell eyesight  
 AHA #9: genetics beauty  
 AHA #10: sculpture ethical dilemmas  
 AHA #11: crime scene police investigation  
 AHA #12: twins inner senses  
 AHA #13: Bill Gates real life DNA bridges  
 AHA #14: art work economics

C. I ONLY KNOW ABOUT \_\_\_\_\_. EXPLAIN \_\_\_\_\_ TO ME.

- AHA #15 Bruce Springsteen cell theory  
 AHA #16: geometric designs life  
 AHA #17:cancer osmosis

**REORGANIZATION / SYNECTICS MODEL**

A. WHAT WOULD HAPPEN IF \_\_\_\_\_ ?

- AHA #1: cells didn't reproduce  
 AHA #2: no flowers  
 AHA #3: we could not communicate  
 AHA #4: viruses were good instead of the typical "bad"  
 AHA #5: if you were microscopic and could travel in the bloodstream?  
 AHA #6: if there were no scientists  
 AHA #7: if you could not feel anything

B. SUPPOSE \_\_\_\_\_ (HAPPENED) WHAT WOULD BE THE CONSEQUENCES?

- AHA #8: there no viruses  
 AHA #9: cell could not reproduce  
 AHA #10: white cells didn't fight infected red cells  
 AHA #11: aids never happened  
 AHA #12: there was no medication  
 AHA #13: there were no fine arts

AHA #14: mathematical equations to help science

C. WHAT WOULD HAPPEN IF THERE WERE NO \_\_\_\_\_ ?

AHA #15: scientists

AHA #16: pharmaceuticals

AHA #17: museums

## CULTURAL LITERACY

### 1. Dates:

1665—Robert Hooke discovers the cell.

1754—Pierre de Maupertuis suggests species transform over time.

1802—Jean—Baptiste Lamarck gives biology its name.

1809—Lamarck's book *Philosophie zoologique* published.

1824—Rene Dutrochet discovers the tissue is made from living cells.

1831—Charles Darwin sets out on his voyage on the *Beagle*.

1833—Robert Brown discovers the cell nucleus.

1859—Charles Darwin published his revolutionary theories about evolution in *On the Origin of Species by Means of Natural Selection*.

1865—Gregor Mendel discovers the laws of genetics.

1866—Gregor Mendel published his theories of genetic inheritance.

1868—Johann Friedrich Miescher discovers nuclein, later renamed DNA.

1889—The term chromosome first used.

1890—Henking describes sex chromosomes and autosomes.

1901—Hugo de Vries first describes mutations.

1902—Walter Sutton linked chromosomes with Mendel's theories of genetics; publishes *The Chromosome Theory of Inheritance*.

1907—Few culture "in vitro" of animal cells by R. Harrison.

1909—Wilhelm Johannsen introduced the term gene, and Archibald Garrod suggests that errors in genes lead to hereditary disorders.

1910—Thomas Hunt Morgan discovers the sex-linked gene.

1926—Morgan's book, *The Theory of the Gene*, is published.

1927—Hermann Muller shows that X rays cause mutation.

1937—Richard Goldschmidt discovers genes exist as points along the chromosome.

Early 1940s—Accumulated evidence showed that DNA must be the carrier of genetic information.

1944—Avery, McCarty, and MacLeod suggest that DNA is involved in the hereditary material.

1950—Chargaff's rules are established about the basic chemistry of DNA.

1952—Hershey and Chase prove that DNA is the hereditary material, and Wilkins and Franklin take X-ray diffraction pictures of DNA.

1953—James Watson and Francis Crick discover the structure of DNA.

1957—Arthur Kornberg shows the "unzipping" of DNA.

1958—Meselson and Stahl demonstrate the nature of DNA replication.

1960—Arthur Kornberg reported he had made DNA in the laboratory.

1961—Crick and Brenner show how base pairs define amino acids.

1961—Francois Jacob and Jacques Monod proposed the means by which genes regulate each other through particular "regulator" genes.

1968—Arthur Kornberg is the first to synthesize a virus.

1973—Har Khorana makes the first synthetic gene. Stanley Cohen and Herbert Boyer reported the first successful genetic engineering experiments.

1974—Geneticists called for a temporary ban on genetic engineering experiments until safety had been considered.

1977—Keiichi Itakura synthesizes the first human hormone, growth hormone using a bacterial cell.

1980—U.S. scientist David Botstein made a rough genome map.

1981—Karl Illmensee clones baby mice.

1985—Alec Jeffreys develops a method of "fingerprinting" with DNA.

1987—Genetically engineered plants are first developed.

1989—Seven cloned calves are born from the same embryo.  
 1990—First human gene therapy trial initiated by Dr. W. French Anderson at the National Institutes of Health, Bethesda, Maryland. Human Genome Project officially began.  
 1991—The sex of a mouse is changed at the embryo stage.  
 1993—Genetic mutation for Huntington’s chorea identified.  
 1994—Dr. Mark H. Skolnick’s team at the University of Utah Medical Center found a gene they believe causes breast cancer.

**2.**

National Geographic  
 Jerry Lee Lewis  
 Frederick Griffith  
 Oswald Avery  
 Aretha Franklin  
 Heimes  
 Des’ree  
 Har Gobind Khorarm

**CULTURAL LITERACY**

act of God  
 aerobic  
 aggression  
 All animals are equal, but some animals are more equal than others  
 Alzheimer’s disease  
 amphibians  
 anemia  
 autistic  
 bibliography  
 blood type  
 Carver, George Washington  
 cell wall  
 clone  
 congenital disease  
 cytoplasm  
 diabetes  
 DNA (deoxyribonucleic acid)  
 Don’t count your chickens before they hatch.  
 double helix  
 electron microscope  
 environment/ hereditary controversy  
 Frank, Anne  
 gene pool  
 genetic engineering  
 genotype  
 habitat  
 heredity  
 Hughes, Langston  
 Insulin  
 Mendel, Gregor  
 mutation  
 nature—nurture controversy  
 O Captain! My Captain! (text)  
 paraphrase  
 profit sharing

adaptation  
 aesthetics  
 AIDS  
  
 allusion.  
 amok, run  
 anaerobic  
 asexual reproduction  
 Beauty is but skin deep  
 biology  
 brave new world  
 cell differentiation  
 chromosomes  
 commodity  
 corporation  
 Darwin, Charles  
 dinosaur  
 dominant trait  
 Don’t judge a book by its cover.  
 Down’s syndrome (trisomy 21)  
 embryo  
 footprints on the sands of time  
 gene  
 genetic code  
 genetics  
 Great oaks from little acorns grow  
 hemophilia  
 Hitler, Adolf  
 immune system  
 Lincoln, Abraham  
 microscope  
 natural selection  
 nucleus (cellular)  
 opposable thumbs  
 platelets  
 prognosis

recessive trait  
red blood cells  
RNA  
sickle—cell anemia  
Twain, Mark  
vital statistics  
white blood cells  
X chromosome  
Y chromosome  
You can't unscramble an egg

recombinant DNA  
ribonucleic acid  
sex—linked trait  
statistics  
Variety is the spice of life  
Watson, James, and Francis Crick  
World War 11  
X—ray  
You can't make an omelet without breaking some eggs

## RESOURCES

### I. Bibliography — Teacher/Professional Books and Resources

Morholt, E., and Brandwein, P. F. (1986). *A Sourcebook for the Biological Sciences*: 3rd ed. San Diego: Harcourt Brace Jovanovich.

Gibbons J.H. (1995). *Scientific American: Triumph of Discovery: A Chronicle of Great Adventures in Science*. New York: Henry Holt & Company.

Tedeschi, Henry (1993). *Cell Physiology: Molecular Dynamics*, 2nd ed.

Wilson, James A. (1979). *Principles of Animal Physiology*, 2nd ed.

DeYoung, H. Garrett (1986). *The Cell Builders*.

Lecourt, Dominique (1977). *Proletarian Science?: The Case of Lysen*.

Heiligman, Deborah (1994). *Barbara McClintock: Alone in her Field*.

Keller, Evelyn Fox (1983). *A Feeling for the Organism*.

Carison, ElofAxei (1981). *Genes, Radiation, end Society*.

Olby, Robert Cecil (1980). *Origins of Mendelism*.

Yeas, Martynas (1969). *The Biological Code*.

Borek, Ernest (1965). *The Code of Life*.

Watson, James D. (1980). *The Double Helix*.

Fletcher, John C. (1982). *Coping with Genetic Disorders*.

Jackson, John F. (1991). *Genetics and You*.

Strom, Charles (1990). *Heredity and Ability*.

Wingerson, Lois (1990). *Mapping our Genes: The Genome Project*.

McAuliffe, Sharon (1981). *Life for Sale*.

Bridwell, Rodger (1983). *High—Tech Investing*.

Doyle, Jack (1985). *Altered Harvest*.

Piller' Charles (1988). *Gene Wars*.

Mabie, Margot C. J. (1993). *Bioethics & the New Medical Technology*.

Zimmerman, Burke K. (1984). *Biofuture: Confronting the Genetic Era*.

Suzuki, David T. (1989). *Genethics*.

Lyon, Jeff(1995). *Altered Fates*.

Rifldn, Jeremy (1983). *Algeny*.

Lappe, Marc (1984). *Broken Code: The Exploitation of DNA*.

Drlica, Karl (1994). *Double—edged Sword*.

Lear, John (1978). *Recombinant DNA: The Untold Story*.

Walker, John (1975). *The National Gallery of Art: Washington*.

Visible Ink Press (1996). *Video Hound's Golden Movie Retriever*.

Crocetti, Gino (1983). *Graduate Record Examination General (Aptitude) Test*.

Green, Jeff (1995). *The Green Book of Songs by Subject: The Thematic Guide to Popular Music*. 4- ea., updated & expanded.

### II. Bibliography — Student Books on loan from Media Center for classroom use

Wondeffful Life, Stephen Jay Gould  
A Brief History of Time, Stephen Hawking  
Raymond's Run, Toni Cade l3ambara  
Brian's Song, William Blium  
The Biological Timebomb, Gurdon Rattray Taylor

The Diary of Anne Frank, Anne Frank  
James and the Giant Peach, Roald Dahl  
The Monster Garden, Vivien Aleock  
Genetic Engineering, Jenny Bryan  
The Genetics Explosion, Alvin Silverstein  
Genetic Engineering, Nigel Hawkes  
Miracles of Genetics, Walter G. Oleksy  
Beggars in Spain, Nancy Kres  
Egg Dancing, Liz Jensen  
Forests of the Night, S. Andrew Swami  
Jupiter's Daughter, Vernon Tom Hyman  
A. Lincoln: His Last 24 Hours, W. Emerson Reck  
Lincoln: A Photobiography, Russeli Freedman  
Hiroshima, John Hershey  
Stephen Hawking's Quest, Kitty Ferguson  
Stephen Hawking: A Life in Science, Michael White  
Me and My Family Tree, Paul Showers  
Jurassic Park (The Junior Novelization), Grossett & Dunlap  
Alex: The Life of a Child, Frank Deford  
The Giver, Lois Lowry

### **III. Educational Videos**

State—sponsored organ donation video or infomercial  
The Body Human  
Chromosomal Basis of Heredity  
DNA: Laboratory of Life (National Geographic Society, 1985)  
Generation Upon Generation (program 12 of 13 from The Ascent of Man Series, 1973)  
The Geometry of Life (Metropolitan Pittsburgh Public Broadcasting, Inc. & The National Academy of Sciences, 1988)  
Incredible Human Machine (National Geographic Society, 1975)  
Living Cells (Aims Media, Inc., 1983)  
Microscope: Indispensable Instrument (Lesson 46 from the Science Screen Report Series, Vol. 19, Issue 1, Allegro Film Productions, 1989)  
The Race for the Double Helix  
Science Mimics Nature (from the Science Screen Report Series, Vol. 17, Issue 5, Allegro Film Productions 1988)  
The Story of Dr. Carver

### **IV. Commercial Videos**

Pudd'nhead Wilson (1987)  
Jurassic Park (1993)  
Cocoon (1985)  
Rain Man (1988)  
JFK(1991)  
Nixon (1996)  
Death Becomes Her (1992)  
Picture of Dorian Gray (1945, 1974)  
aerobic workout video (i.e., Jane Fonda or other)  
Outbreak (1994)  
Forbidden World (1982)  
The Elephant Man (1980)  
Species (1995)  
Island of Dr. Moreau (1977)  
Fantastic Voyage (1966)  
Mask (1985)  
Twins (1988)  
The Boys from Brazil (1978)  
The Boy in the Plastic Bubble (1976)

Brian's Song (1971)  
Forever Young (1992)  
Six Weeks (1982)  
Chariots of Fire (1981)  
Rocky (1976)  
Charly (1968)  
Coma (1978)  
Medicine Man (1992)  
Dr. JeFyll & Mr. Hyde (1920,1931,1941,1968,1973)  
Copacabana (1947)  
Dances with Wolves (1990)  
Dying Young (1991)  
Love Affair: The Eleanor & Lou Gehrig Story (1977)  
A Dream of Kings (1969)  
East of Kilimanjaro (1959)  
1984 (1984)

## **V. Literature!Language Arts (on reserve in Media Center)**

### **Fiction**

Puddinhead Wilson, Mark Twain  
The Hungry, Hungry Caterpillar, Eric Cane  
Brave New World, Albert Carnus  
Jurassic Park. Michael Crichtori  
Flowers for Algemon, Daniel Keyes  
"From One Home to Another", Julia Alford Davis  
Annie and the Old One, Miska Miles  
The Island of Dr. Moreau, H.G. Wells  
The Lost World, Sir Arthur Conan Doyle  
Give Yourself Goosebumps: The Deadly Expenments of Dr. EEEk, R.L. Stein  
Give Yourself Goosebumps: The Attack of the Mutant, R.L. Stein  
Monster Blood 11, R.L. Stein  
The Andromeda Strain, Michael Crichton  
Outbreak, Robin Cook  
Mortal Fear, Robin Cook  
Coma, Robin Cook  
It Is Better to Die Forever, Chewing Blackbones  
Rip Van Winkle, Washington Irving  
The Medicine Bag, Virginia 'Driving Hawk'  
The Strange Case of Dr. Jekyll and Mr. Hyde,  
The Picture of Dorian Gray, Oscar Wilde  
The Boys from Brazil, Ira Levin  
Red Bearded Men, Sir Arthur Conan Doyle  
1984, George Orwell

### **Non—Fiction**

Stwertka, Eve and Albert (1988). Microscope: How to Use It and Enjoy It. Englewood Cliffs, NJ: Julian Messner.  
Nachtigall, Werner (1995). Exploring with the Microscope. New York: Sterling Publishing Co., Inc. Bleifeld, Maurice (1988). Experimenting with a Microscope. New York: Franklin Watts.  
Bodanis, David (1984). The Body Book: A Fantastic Voyage to the World Within. Boston: Little, Brown and Company.  
Taylor, Ron (1981). The Story of Evolution. New York: Warwick Press.  
Gamlin, Linda (1993). Eyewitness Science: Evolution. New York: Dorling Kindersley.  
Asimov, Isaac (1983). How Did We Find Out About Genes? New York: Walker and Company.  
Aronson, Billy (1993). They Came from DNA. New York: W. H. Freeman and Company. Gamlin, Linda (1988). Today's World: Origins of Life. New York: Gloucester Press.  
Anderson, Lucia (1978). The Smallest Life Around Us. New York: Crown Publishers, Inc. Hooper, Tony (1994). Breakthrough Genetics. Austin, TX: Raintree Steck—Vaughn.

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 Twist, Clint (1994). *Charles Darwin on the Trail of Evolution*. Austin, TX: Raintree Steck—Vaughn.  
 Arnold, Caroline (1986). *History of Science: Genetics from Mendel to Gene Splicing*. New York: Franklin  
 Watts  
 Patent, Dorothy Hinshaw (1989). *Grandfather’s Nose — Why We Look Alike or Different*. New York:  
 Franklin Watts.  
 Lipke, Jean Coryllet (1971). *Heredity*. Minneapolis, MN: Lerner Publications Company.  
 Gutnik, Martin J. (1985). *Genetics*. New York: Franklin Watts.  
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 Pornerantz, Charlotte (1969). *Why You Look Like You, Whereas I Tend to Look Like Me*.  
 Young Scott Books.  
 Ingram, Jay (1988). *Twins*. New York: Simon and Schuster Books.  
 Balkwill, Fran (1993). *Cells Are Us*. Minneapolis, MN: Carolrhoda Books, Inc.  
 Fradin, Dennis (1987). *A New True Book: Heredity*. Chicago, IL: Children’s Press.  
 Quackenbush, Robert (1983). *The Beagle and Mr. Flycatcher: a Story of Charles Darwin*. Englewood Cliffs, NY:  
 Prentice—Hall, Inc.  
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*Genetics: Nature’s Blueprints*. San Diego, CA: Lucent Books. National Geographic Society (1994). *Frontline of  
 Discovery*. Washington, D.C.: National Geographic Society. Byrnes, Ken. *The Civil War*.  
 Mead, Margaret. *Coming of Age in Samoa*.

### **Poetry**

“Eggs! “, Jack Prelutsky  
 “Microscopic Topic” Jack Prelutsky  
 ”The Twins”, Elizabeth Madox Roberts  
 “The Baby Brother”, Jack Prelutsky  
 “Be Glad Your Nose is on Your Face”, Jack Prelutsky  
 “Song of a Woman Abandoned by the Tribe Because She is Too Old to Keep Up With Their Migration”, Mary Austin  
 “Rabbi Ben Ezra”, Robert Browning  
 “As I Grew Older”, Langston Hughes  
 “Nature’ Is What We See”, Emily Dickinson  
 “Beauty”, E—Yeh—Shure  
 “There is a Thing”, Jack Prelutsky  
 “Bits of Glass”, Spencer Brown  
 “Abraham Lincoln”, Mildred Plew Meigs  
 “Abraham Lincoln 1809—1865”, Rosemary Carr & Stephen  
 “Chambered Nautilus”, Holmes  
 “When Dracula Went to the Blood Bank”, Jack Prelutsky  
 “Oh Captain! My Captain! “, Walt Whitman

### **Drama (Stage Productions)**

“The Miracle Worker”  
 “The Diary of Anne Frank”  
 “Rip Van Winkle”  
 “Our Town”

### **Art Works**

Zirchow Vil, Lyonel Feiuinger  
 Lozenge in Red, Yellow, and Blue, Piet Mondrian  
 Nude Woman, Pablo Picasso  
 Family of Saltimbanques, Pablo Picasso  
 Cupid with the Wheel of Foffune, Titian  
 The Annunciation, Titian  
 Lincoln, Norman Rockwell  
 A Family Tree, Norman Rockwell

Aniencan Gothic, Grant Wood  
The Adoration of the Maori. Botticelli

### **Music**

“In the Year 2525”, Zager & Evans  
“Let the Show Go On”, Three—Dog Night  
“Send in the Clowns”, Judy Collins, Frank Sinatra, Barbra Streisand, Carmen MeRac  
“Living Without You”, The Letterman  
“What A Wonderful World”, Louis Armstrong  
“Anticipation”, Carly Simon  
“You Must have been a Beautiful Baby”, Bobby Darin, Johnny Mercer  
“Everything is Beautiful”  
“Heard It through the Grapevine”, Marvin Gaye  
“Side Show”, Blue Magic  
“Green, Green”, New Christy Minstrels  
“Physical”, Olivia Newton—John  
theme song from Rocky  
theme song from Chanots of Fire  
“Baby Face”, Bobby Darin  
“I’ve Grown Accustomed to Her Face”, Rex Harrison (My Fair Lady), Tony Bennett  
“We are the World”, USA for Africa  
“It’s in Every One of Us”, David Pomeranz  
theme song from Jeopardy  
“Purple People Eater”, Sheb Wooley  
“Chances Are”, Johnny Mathis  
“Conga”, Miami Sound Machine  
“Luck Be a Lady”, Frank Sinatra  
“I Am. I Said”, Neil Diamond  
“Mr. Lincoln”, Hank Williams, Jr.

### **VI. Resource PeopleMentors**

geneticists  
geriatric nurses  
AIDS/HIV positive individuals  
sickle cell anemia carriers  
genetic counselors  
maternal/fetal physicians dieticians  
FBI/criminologists  
plastic surgeons  
cosmetologists  
model agents  
phlebotomists  
microbiologists

### **VII. Field Trips**

a blood bank  
a hospital  
a medical college  
a nursing home  
a nature preserve  
a zoo

### **VIII. Other Material (CD—ROM, Laser Disc, WWW)**

Magazines  
National Geographic, September 1976, pp. 355—407.  
National Geographic, September 1991, pp. 64—93

National Geographic, May 1992, pp. 112—124  
Kids Discover, “Lincoln” issue, Vol. 5, Issue 10, December 1995.  
Scientific American, July 1996, pp. 52—59  
Scientific American, April 1996, pp. 84—91  
Scientific American, March 1996, pp. 100—105  
Scientific American, January 1996, pp. 27—30  
Scientific American, December 1995, pp. 52—59  
Scientific American, November 1995, pp. 26  
Scientific American, September 1995, pp. 124—128  
Scientific American, April 1995, pp. 72—78  
Scientific American, March 1995, pp. 72—7  
Scientific American, January 1995, pp. 70—75  
Scientific American, December 1994, pp. 76—82  
Scientific American, November 1994, pp. 5645, 90—97

#### **Web (WWW) Sites**

“DNA Fingerprinting and Its Admissibility in Court” <http://ag.arizona.edu/dukchirschmlbio.html>  
“Introduction to Human Genome Project (HUGO)” [http://www.gdb.org/Danil\)OE/priml.html#1](http://www.gdb.org/Danil)OE/priml.html#1)  
Yahoo Search for “dna” <http://www.yahoo.com>

#### **Laser Discs**

STV: Human body, volume 1: circulatory, respiratory, and digestive systems. Washington: National Geographic, 1992.  
Science Discovery, Videodiscovery, Inc., 1992  
STS Science Forums, Vol. 2. “Transgenic Organisms” Videodiscovery, Inc., 1993

#### **CD-ROM**

“The Magic School Bus: Explores the Human Body,” Microsoft Home, 1995.  
“Coxy Everson: Body, Mind & Soul,” Philips, 1995.  
“Mosby’s Medical Encyclopedia,” Sofikey, 1995.  
“Body Works, Ver. 5.0,” Softkey, 1995.  
“The Family Doctor, 4th ed.,” Creative Media.  
“Body Works Voyager,” Sofikey, 1995.  
“Total Body,” Softkey, 1994.  
“Mayo Cimi . Family Health,” IVI, 1996.  
“A.D.A.M.: the Inside Story,” A.D.A.M., 1995.  
“American Medical Association Family Medical Guide,” 1995.  
“Family Tree Maker,” Banner Blue.