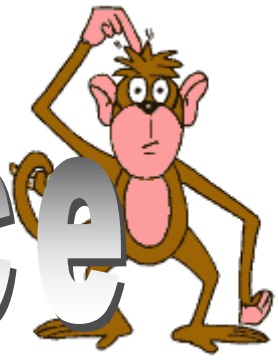
Life Science



With Mr. Brown

Name: _____

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Final Grade for Life Science

Your final grade is based on the following assignments, activities, and assessments…

Test 35%

Test Total ____ / _____ = _____ x 0.35 = [ ]

3 Quizzes 25%

quiz 1: page 1-10 (100 points)
quiz 2: pages 11-22 (100 points)
quiz 3: pages 23-28 (100 points)
quiz 4: pages 29-47 (100 points)
quiz 5: pages 48-58 (100 points)

Total Quizzes _____ / 500 points = _____ *x 0.25 = [ ]*

Special Assignments 20%

Building Blocks Activity (page 9) (8 points)
Plant and Animal Cell Lab (pages 20-21) (10 points)
Peas in a Pod Lab (pages 26-27) (10 points)
Extracting DNA (page 45) (10 points)
Corn Sprout Lab (page 50) (10 points)

Special Assignments total _____ / 48 points = _____ *x 0.2 = [ ]*

Learning Packet 10%

Page 4-5 (5 points)
Page 6 (4 points)
Page 7 (5 points)
Page 8 (6 points)
Video: Life Science Cells (5 points)
Page 19 & 21 (8 points)
Video: Biology The Science of Life: The Living Cell (p. 22) (5 points)
Video: Cell Division (p.25) (5 points)
Video: Genes, Genetics and DNA (5 points)
Pages 33-24 (6 points)
Page 39 Article Question (3 points)
Page 44 Article Question (3 points)
Page 46 Article Question (3 points)
Page 48-49 (6 points)
Page 56 Article Questions (6 points)
Page 57 Article Questions (4 points)
Video: Organisms in their Environment (page 58) (5 points)

Learning Packet Total _____ / 84 points = _____ x 0.1 = [ ]

4 OOCA's 10%

OOCA #1 (15 points)
OOCA #2 (15 points)
OOCA #3 (15 points)
OOCA #4 (15 points)
OOCA Total _____ / 60 points = _____ x 0.1 = [ ]

Add the numbers in the brackets to find your final percentage.

Grading Rubric Categories

1. Completeness

5	4	3	2 or 1
All required elements are present and additional elements that add to the report (e.g., thoughtful comments, graphics) have been added.	All required elements are present.	One or two required elements are missing, but additional elements that add to the report (e.g., thoughtful comments, graphics) have been added.	Several required elements are missing.

2. Appearance/Organization

5	4	3	2 or 1
Quality appearance	Neat and orderly, easy to follow.	Moderately neat, some disorder.	Lacks neatness and orderliness. Hard to understand

3. Pride

5	4	3	2 or 1
Work reflects this student's best efforts.	Work reflects a strong effort from this student.	Work reflects some effort from this student.	Work reflects very little effort on the part of this student.

4. Showing Understanding

5	4	3	2 or 1
Explanations indicate a very clear understanding of topic.	Explanations indicate a mostly clear understanding of topic.	Explanations indicate some understanding of the topic.	Explanations do not indicate much understanding of topic.

5. Accuracy

5	4	3	2 or 1
All information and answers given are accurate	Almost all information and answers given are accurate. Only very few inaccurate information or answers.	Most of the information and answers given are accurate but there is a lot of inaccurate information or answers.	A lot of inaccurate information or answers given.

Common Comments

1 Be sure to explain. Make your explanations very clear, possibly giving examples to make them clear.

2 Use examples to help make your point. You can use words such as "For example," or "For instance," etc.

3 You forgot to do a portion of the question or assignment.

4 Put more effort into your work / answers. Try a little harder.

5 It's hard to understand what you mean. Try rewording it or organizing your ideas so that they are easier to understand.

6 It seems like you rushed. Take your time, and do the best work that you can do!

7 Make sure you follow the directions. Read the directions completely.

Section 1: Characteristics and Structure of Life

Welcome to Life Science!

Our Life Science Unit is going to be a great unit. We are going to learn a lot about living things. There are living things all around us. Some of these living things we can't see with the naked eye, but without them, our lives wouldn't be the same! In fact, all living things are made of tiny living cells that most of the time you need a microscope to see. Life is important, and it's all around us. Let's dive in and study Life Science.

Indicator 2.1 & 2.4

How Do you Know if Something is Living? (Courtesy of *Life Science Connections*)
All living things have five characteristics. That means, something is alive when it has all five of these things. Write the five characteristics below.

5 Characteristics of Living Things

1) _____

2) _____

3) _____

4) _____

5) _____

Some of those words and phrases we may not use everyday, and they can be a bit difficult to understand without further explanation. So, let's talk a bit about each characteristic to help us understand.

- **Organization**
  - All living things (organisms) are organized. This means that they are specially designed to perform different life functions. The smallest level of organization of living things is cells. Cells are the smallest unit of life.

  - Extra notes to help you understand: _____

    _____

    _____

    _____

- **Reproduction**
  - All organisms have the ability to reproduce. Organisms produce new organisms that are similar to them.

  - Extra Notes to help you understand: _____

    _____

    _____

    _____

- **Adjust to Surroundings**
  - All organisms have the ability to adjust (change) to their surrounding. An example of this is that organisms respond to stimuli. For example, if a flea made a dog's nose itch (the stimulus), the dog would scratch its nose (response to stimulus).

  - Extra Notes to help you understand: _____

    _____

    _____

    _____

- **Growth and Development**
  - Most organisms grow. When they grow, they go through changes known as development.

  - Extra Notes to help you understand: _____

    _____

    _____

    _____

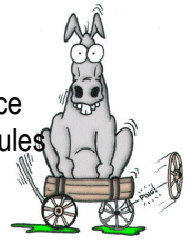
- **Energy, water and minerals**
  - All organisms need these items to function. If they do not get any of these, organisms die.

  - Extra Notes to help you understand: _____

    _____

    _____

If something does not have all of the 5 characteristics of life that you listed on the previous page, then it is **not a living thing!**



Note: There are a few exceptions to the rules above. For example, mules cannot reproduce because they are sterile. This just goes to show that nature doesn't always follow simple rules of organization!

Indicators 2.1 & 2.2

Two Important Definitions

Before we go on, two important life science terms were mentioned above: *cell* and *organism*. Let's look at their definitions.

Cell: The smallest unit of life. A cell contains all the materials necessary for life
Organism: A living thing.

The term *organism* is pretty simple. It's just a science geeky term for any living thing. However, the term *cell* may be a bit more difficult to understand, perhaps because most of them are so small that we can't see them without magnification. There really is a whole other world out there that we can't see. It's microscopic! To help us understand the term cell, you are going to do a small reading activity. *Do the cell activity on the next page*.

Animal Lady Visit!

Indicators 2.1 – 2.8

My sister-in-law, Mrs. Heidi Brown, is bringing in a bunch of animals to show off. She is very knowledgeable about her animals and will answer many of your questions. When learning about these animals, think about the characteristics of living things, and think about how many cells each animal must be made of.



Directions: *Below, write 4 facts that you learn during The Animal Lady's visit. Be sure to state the fact completely.*

(1) _____

_____

(2) _____

_____

(3) _____

_____

(4) _____

_____

Indicators 2.1 & 2.2

Cells

Cell Reading Activity

Directions: Read the following passages. Then, answer the questions that follow.
(courtesy of "Invitations to Cells: Life's Building Blocks." Author: Camp, Carole Ann, Ed.)

Cell Reading 1

The basic structural unit of life is the cell. A cell is the smallest unit that can carry on all of the activities of life. All living things are made up of cells. A human body contains about 100 trillion cells. Cells that perform similar functions tend to be similar in size and shape. The range of cell size is enormous. Some cells, like nerve cells, can be as long as a meter, and still be invisible to the naked eye. Some cells, like viruses, can be seen only through electron microscopes. The yolk of a chicken egg or an ostrich egg is only one cell.

Cell Reading 2

All living things are made up of small individual units called cells. A cell is the smallest unit that can carry on all of the activities of life. Some organisms consist of one cell, while others consist of billions of cells. These cells are essential to continued life and require many of the same necessities that the larger organisms require. It is difficult to imagine that an organism the size of a human being is comprised of millions of billions of cells. It is also important to realize that it does not matter whether the organism consists of one cell, many cells, or billions of cells, the basic functions required for survival are similar for all organisms. For example, all organisms need nourishment.

In a single-cell organism, all functions are carried out by that one cell. In a multicellular organism, cells begin to specialize and work together to carry out individual functions.

Questions

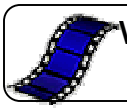
1) Which passage, "Cell Reading 1" or "Cell Reading 2," did you find more interesting? Why?

2) In your own words, write a definition for the term *cell.*

3) How many cells is the yoke of a chicken egg made of?

4) Are the basic functions required for survival similar for all organisms? In which reading did you find the answer to this question?

5) "*Cell Reading 2"* talks about a multicellular organism. What do you think a multicellular organism is?



Video Clip: "Cells: The Building Blocks of Life" (1min 3 sec)

Cells Web Activity

Indicators 2.1 & 2.2

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(p.8)

View and read the web presentation created by The Cancer Research UK. Then, answer the questions that follow.

To get to the presentation…
(1) Go to www.RockaBrain.com
(2) Click on "Learning Place"
(3) Scroll down to "Life Sciences" and click on "Living Things Begin as a Single Cell."
(4) Click the link to the presentation.

Directions: View the presentation and answer the following questions in complete sentences.

1) All living things begin life as how many cells? _____

_____

2) What type of instrument would you need to see a cell on your own body? _____

_____

3) What is DNA? _____

_____

4) A cell divides into two separate cells using a process called what? _____

_____

5) Explain how a cell divides into two separate cells. _____

_____

_____

+

_____

_____

6) If your cells were each 1cm, how big would you be? _____

_____

___/ 5 SA
(p.10)

Indicators 2.1 & 2.2

Building Blocks Activity

All living things are made of cells. Cells are sort of like building blocks. You may have built something out of building blocks before. Maybe you've built a Lego car or house or something… If you have, the things that you built were made of building blocks. Well, living things are made of cells, similar to the way that some things are made of building blocks. It's hard to imagine because cells are so small, but when you look at a living thing, you are actually looking at a bunch of tiny little cells put together to form what you are looking at!

Directions: *Fill in each box with your prediction as to how many of the things noted at the top of the column it would take to "build" the things shown on the left.*

Organism	**Prediction… How many large blocks if ant = 1 large block**	**Prediction… How many kernel corn if ant = corn kernel**	**Prediction… How many salt crystals If ant = 100 salt crystals**
Worm			
Mouse			
Collie Dog			
Human			
Horse			
Elephant			
Whale			

Imagine a block smaller than salt so small that you can't see it with the naked eye. In the box below, draw a picture of what you think this block might look like through a microscope.

Name:_____ Class Period _____

Indicators 2.1, 2.2 & 2.3

Short Video (16min 7sec): Life Science Cells

Directions: Below, write 5 facts from the movie.

(1) _____

_____

(2) _____

_____

(3) _____

_____

(4) _____

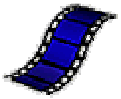
_____

(5) _____

_____

Organelles and Other Structures Found Within Cells

Cells might be small, but there are many things going on in a cell. In fact, some people describe a cell as being like a little city. It's true. Cells have much going on inside. We can't see the things going on with our "naked eye," but with the help of microscopes and other special devices we can see all of the work going on inside of a cell. People that have studied cells have seen the following things and noted what they were doing. Below is a description of each.



Short Video Clip: "What Goes on Inside Cells?"
We are also going to be watching a short video clip for each organelle that we talk about below.

Cell Wall

The ***cell wall*** is a rigid structure outside the cell membrane that supports and protects the cell (for plants, fungi, and some protists and bacteria).
The cell wall is made of tough cellulose fibers and other materials made by the cell. Note: fungal cell walls contain chitin instead of cellulose.

The cell wall is a rigid structure outside the cell membrane

Cell Membrane

The ***cell membrane*** is a structure that forms the outer boundary of the cell and allows only certain materials to move into and out of the cell.

Food, oxygen and water move into the cell through the membrane. Waste products also leave through the membrane.

Cells that perform photosynthesis (plants and some protists) take in carbon dioxide through the cell membrane instead of oxygen.

The cell membrane allows only certain materials to move in and out of the cell

Nucleus

The largest organelle in the cytoplasm of a eukaryotic cell is usually the ***nucleus***, a structure that directs all the activities of the cell.

The nucleus is like a manager who directs everyday business for a company and passes on information to new cells. The nucleus contains genetic blueprints for the operations of the cell.

The Manager, Mr. Nucleus

Vacuole

Remember the last vacation you took? Your suitcase temporarily stored your clothes. Within a cell, a *vacuole* fills a similar role as a temporary storage space for the cell.

Like your suitecase, a vacuole is a temporary storage space for the cell.

Vacuoles store water, food, pigments, waste or other materials.

Vacuoles are large in plant cells and small in animal cells. Vacuoles can also be found in fungi and protists.

Vesicles

Just like a taxi transports people, ***vesicles*** transport protein packages created by the *golgi bodies*.

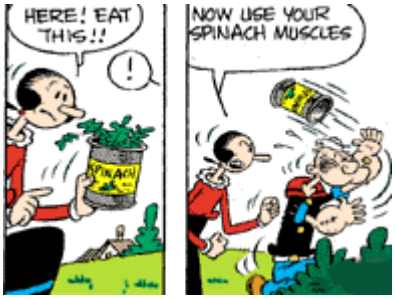
Vesicles transport proteins.

Ribosomes

One chemical that takes part in nearly every cell activity is protein. Proteins are needed for chemical reactions that take place in the cytoplasm.

Cells make their own proteins on small structures in the cytoplasm called ***ribosomes*.**

Ribosomes are either free floating in the cytoplasm of a cell or attached to Endoplasmic Reticulum in a cell.



Popeye is active because he eats spinach. However, for Popeye's *cells* to be active, his ribosomes help create proteins.

Golgi Bodies

In a business, products are made, packaged, and moved to loading docks to be carried away.

In cells, structures called ***Golgi Bodies*** are stacks of membrane-covered sacs that package and move proteins to the outside of the cell. Golgi bodies are the packaging and secreting organelles of the cell.

Golgi Bodies package and move proteins

When something is secreted, it is given off by the cell.

Note: Golgi Bodies are sometimes referred to as Golgi Apparatus.

Mitochondria

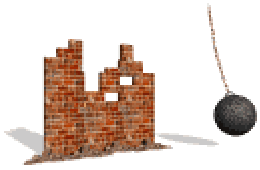
Cells require a continuous supply of energy. ***Mitochondria*** are organelles where food molecules are broken down and energy is released. The energy is then stored in other molecules that can power cell reactions easily.

Just as a power plant supplies energy to a business, mitochondria release energy for the cell.

The mitochondria are where energy is released

Lysosomes

An active cell constantly produces waste products. In the cytoplasm, organelles called ***lysosomes*** contain chemicals (enzymes) that digest wastes and worn-out cell parts. These chemicals also break down food.



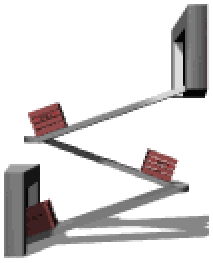
A Lysosome acts as a wrecking ball that breaks apart wastes or worn out cell parts.

Endoplasmic Reticulum

The ***Endoplasmic Reticulum (ER)*** is a folded membrane that moves materials around in the cell. The ER extends from the nucleus to the cell membrane and takes up quite a bit of space in some cells.

The ER is like a system of conveyor belts in a business. They act as tunnels in which materials move from one place to another within the cell.

There are two different types of ER: *Smooth ER* and *Rough ER*. Rough ER has ribosomes attached to its outer membrane, while Smooth ER does not.



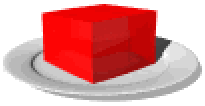
The ER is like a system of conveyors moving materials from one place to another

Cytoplasm

Cytoplasm is the gel-like material inside the cell membrane and outside the nucleus.

Cytoplasm contains a large amount of water and many chemicals and structures that carry out the life processes in the cell. These structures that the cytoplasm contains are called organelles.

Unlike a gelatin dessert, however, cytoplasm constantly moves or streams.



Cytoplasm is the gel-like material inside the cell (but unlike gelatin it *does* flow)

Chloroplasts
Chloroplasts contain a green pigment called chlorophyll. This is what makes plants green.

Chloroplasts take in sunlight, water and carbon dioxide to make oxygen and sugar (a form of food). This process is called photosynthesis.

A plant's chloroplasts convert light energy into chemical energy

BrainPop Short (Cell Specialization)

Indicator 2.1 & 2.2

Organelle Quick Definitions and Cards

Below are quick definitions for each of the organelles that we've discussed. Following the definitions is a page of organelle cards. We are going to cut out the organelle cards and write the correct definition on the back of each card. We will use these to play games and to study.

Cell Wall: A tough structure outside the cell membrane that supports and protects the cell (animal cells do not have a cell wall).

Cell Membrane: Surrounds the cell and only allows certain materials to move into and out of the cell.

Nucleus: Directs all the activities of the cell. It is like a manager of the cell.

Vacuole: A temporary storage place for the cell (like a suitcase)

Vesicles: transports protein packages created by the golgi bodies.

Ribosomes: Helps to create protein

Golgi Bodies: Packages and moves proteins to the outside of the cell.

Mitochondria: Releases energy for the cell.

Lysosomes: Digests wastes and worn-out cell parts.

Endoplasmic Reticulum: Moves material around the cell, like a system of conveyor belts.

Cytoplasm: Gel-like material inside the cell membrane and outside the nucleus

Chloroplasts: Takes in sunlight, water and carbon dioxide and converts it to food.

Indicator 2.1 & 2.2

Cell City USA Play

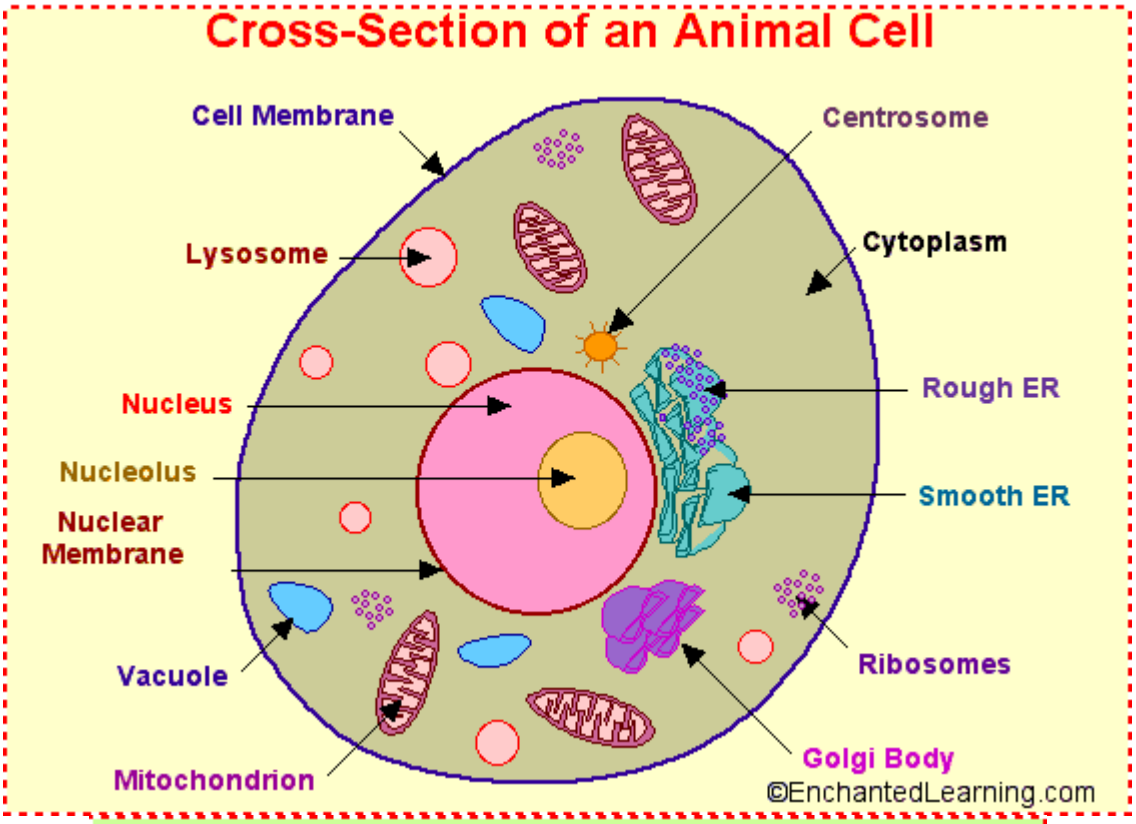
Characters:
Mr. Cell Membrane
Mr. Cell Nucleus
Cytoplasm
Lysosome Larry
Lysosome Mary
Ribby Ribosome
Mike Mitochondria
Vacuole Vicki

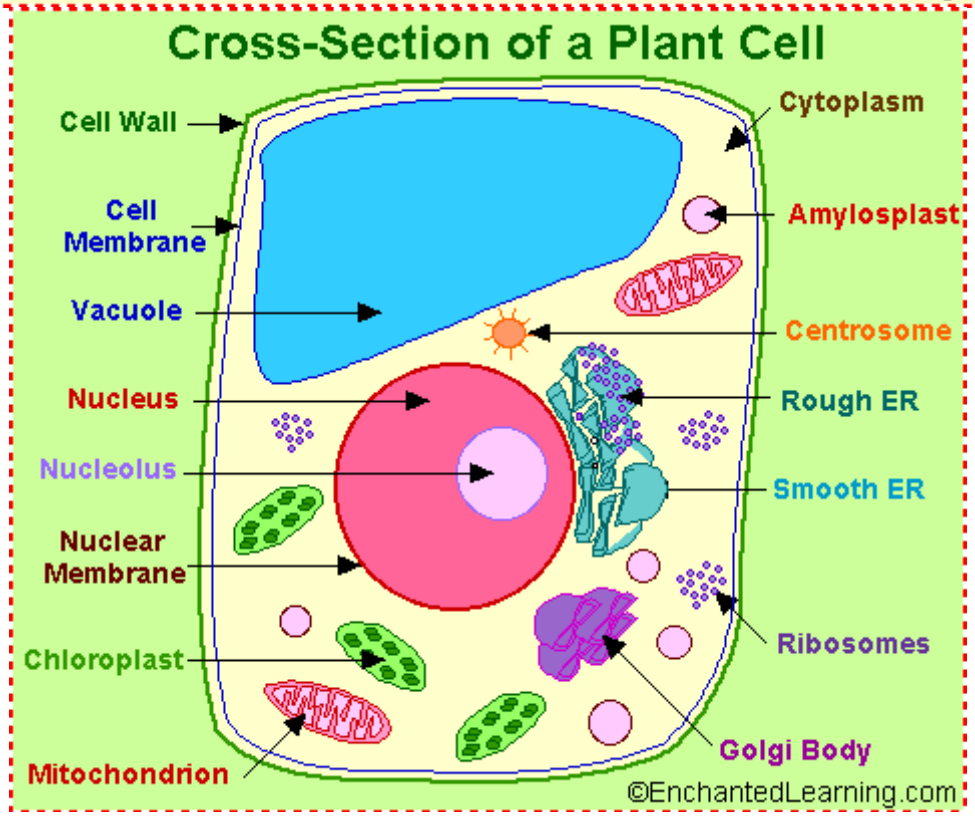
Cytoplasm: *[Circle throughout the cell during the play. Everybody swims around in you]*
Mr. Cell Membrane: [*standing watching for things to come in and go out.]*
Lysosome Larry: *[walks up to Mr. Cell Membrane]* Hello Mr. Cell Membrane. What are you doing today?
Mr. Cell Membrane: Oh, I'm just letting certain things come in and go out of the city. What are you doing?
Lysosome Larry: Oh, same old stuff. I'm the garbage man… you know, cleaning up the waste of the city.
Mr. Cell Membrane: *[look at Lysosome Larry sarcastically]* Oh, ummm… that sounds like fun
Lysosome Mary: *[walks up to Lysosome Larry and Mr. Cell Membrane and talks very quickly and energetically]* Hey Larry! Hey C.M.! What are you guys up to? Actually, I don't care…. Hey Larry, I just finished cleaning up the wastes in my area. HAA!! Did you finish?
Lysosome Larry: Well, actually I was just getting back to work. See ya! *[go back to cleaning up]*
Mike Mitochondria: *[Run up and ZAP Lysosome Larry as he's leaving]* ZAP! I'm giving you energy. Zap! I'm giving your power. ZAP ZAP! *[go off stage]*
Lysosome Larry: *[While Mike Mitochondria is zapping you…]* OUCH!! OUCH!! I've got energy!! *[Then, go off stage]*
Lysosome Mary: That was umm… weird.
Mr. Cell Membrane: Ah ha! Look. Something is coming
Props.. have the food approach the cell membrane
Mr. Cell Membrane: *[looking at the thing approaching]* hmm… hmm….
Lysosome Mary: Are you going to let it in? Actually, I don't care. I'm leaving. Bye *[Run off stage]*
Mr. Cell Membrane: *[talking to self, feeling very important]* Let me see. Yes, this is food. Our city can use this. Come on in. *[allow the food to come in]*
Endoplasmic Reticulum: *[approach food and move food along like you are a conveyor belt]*
Ribby Ribosome: *[move along like you are sitting on Endoplasmic Reticulum. Grab the food and make it into protein while you sing this song.]* I will turn this food…. Into protein that is good… *[repeat a few times]* There. I've finished.
Goldy GolgiBody: *[in a funny voice]* Did I hear that right? Did I? Did I? A protein is finished. Woohoo! *[begin packaging the protein]* Good work Ribby. I'm packaging it and moving it.
Ribby Ribosome: *[saying it like you're wondering why he's talking to you because you don't care for him]* Yeah… ok… Well, I'm done here. It's quitting time. See ya. *[Give the extra food that you haven't completed yet to Vicki Vacuole to store]*. Here you go. Store this.
Vacuole Vicki: Gee thanks! *[sarcastically]*
Ribby Ribosome: *[start walking home and pass Lysosome Larry and Mr. Cell Nucleus…]*
Mr. Cell Nucleus: *[yelling at Lysosome Larry]* Lysosome Mary finished her job. Why didn't you? Get moving! Get moving!
Mike Mitochondria: *[chasing Lysosome Larry to ZAP him…]* Yeah, get moving. Zap, ZAP, ZAP…

Indicator 2.1, 2.2 & 2.3

The End

Plant Cells and Animal Cells





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(p.18)

Indicator 2.1, 2.2 & 2.3

How Plant Cells Differ from Animal Cells

Look at the diagrams of the cells on the different page. What differences do you notice between a plant cell and an animal cell? Make sure to tell all the differences you see.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Indicator 2.1, 2.2, and 2.3

More about Cells

Plants and animals are made up of many cells. A cell is the smallest unit that carries on all the activities of life. Most cells are surrounded by water. Water is also present inside the cell. Water is integrally responsible for the shape of the cell membrane.

There are basically two kinds of cells: eukaryote cells have a nucleus; prokaryote cells do not. Fossils show evidence of many prokaryote cells. The only prokaryotes alive today, as far as is known, are the bacteria.

Plant cells may contain chloroplasts in the cytoplasm. Chloroplasts are the cell parts that contain chlorophyll, the green pigment that gives plants their color. Chlorophyll traps energy from the sun from which the plants make food.

The smallest single-celled animal has the same needs and requirements to survive as the most complex animal that walks this earth. Needs that are important for humans, such as breathing, obtaining food, and successfully reproducing, are also important to the single-celled organism. These functions are carried out in organelles, tiny cell structures which have a particular function.

Eukaryote Cells: Cells that have a nucleus
Prokaryote Cells: Cells that DO NOT have a nucleus.

___/ 15 SA
(pp.19-20)

Indicator 2.1 & 2.3

Plant and Animal Cell Lab

Materials

- Microscope
- Slides
- Onion membrane
- Lettuce
- Elodea leaf slides
- Toothpicks
- Iodine
- Pond water (if possible)

Directions

View each item listed below under a microscope. Be sure to setup the slides appropriately as I will show in class. Draw what you see for each item listed below. Be sure to make your drawing as detailed as possible and to label the cell parts that you can identify. **Do this lab in pencil!**

Onion Membrane

Lettuce

Elodea Leaf

Cheek Skin

___/ 5
(p.20)

Plant and Animal Cell Lab (continued…)

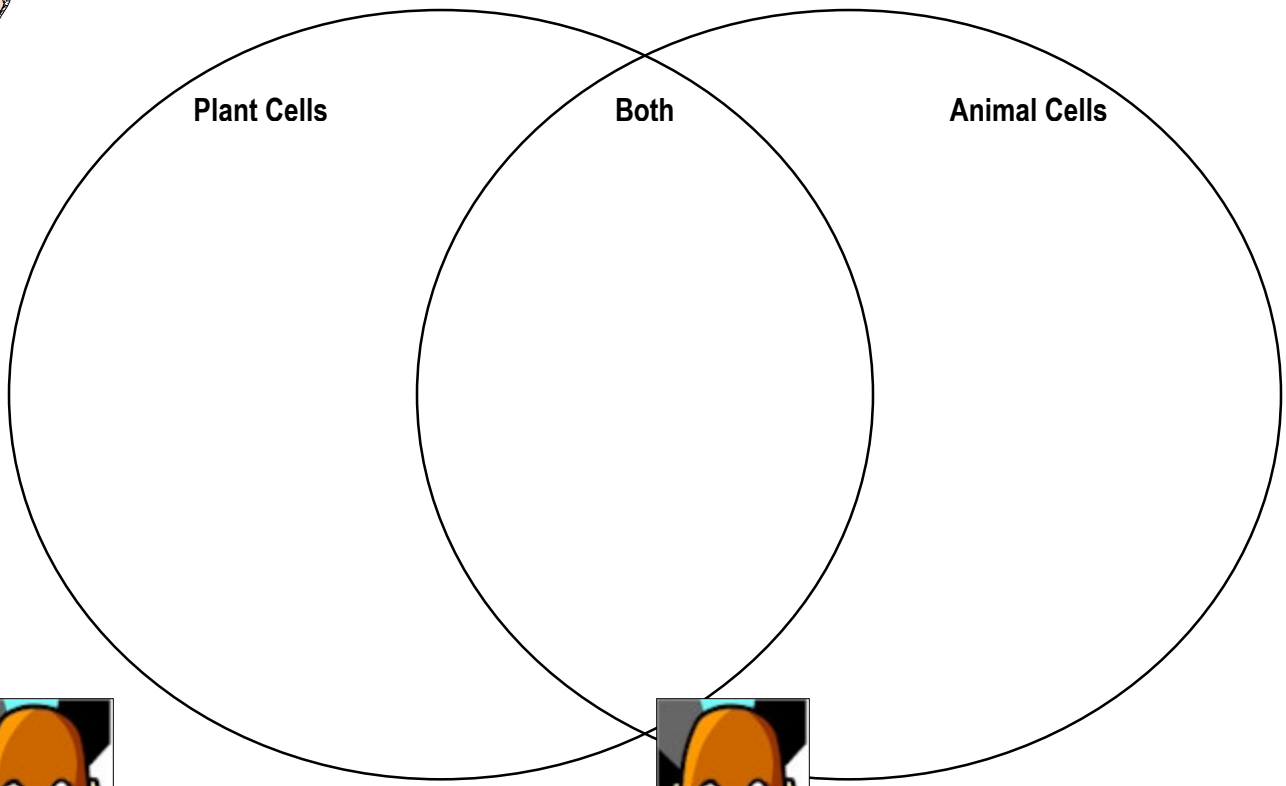
Name of Item_____

Name of Item_____

Indicator 2.1 & 2.3

Plant and Animal Cell Venn Diagram

Directions: Fill in the Venn diagram below using information that you know about plant and animal cells.



BrainPop Short: Cell Specialization
This BrainPop will help us to further understand differences between various types of cells.

BrainPop Short: Stem Cell
This BrainPop will introduce us to another type of cell.

Name:_____ Class Period _____

Indicators 2.1, 2.2 & 2.3

Short Video (15min 14sec): Biology The Science of Life: The Living Cell

Directions: Below, write 5 facts from the movie.

(1) _____

_____

(2) _____

_____

(3) _____

_____

(4) _____

_____

(5) _____

_____

Indicator 2.2

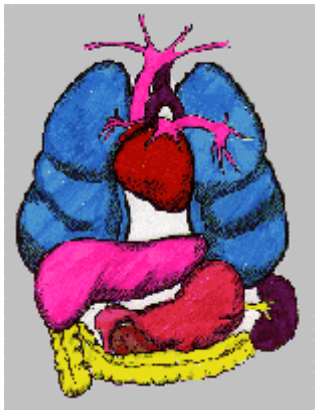
Cells Grouping Together

Cells stick together. If they didn't, living things would just be a pile of cells that could separate and blow away. That wouldn't be cool! This does not happen. Cells stick together. Cells go together to make tissues. Tissues together make organs. Organs go together to make Organ Systems. Each performs specialized functions that help living things survive.

Tissue: A group of like cells that group together to make an organ
Organ: A structure (such as a heart, kidney, etc.) that is made of tissues and performs some specific function in an organism.
Organ System: Organs working together for a specific function.

The human body is made up of several organ systems that work together as one unit. Some major organ systems of the body are listed below, along with several organs that are associated with each system.

Circulatory System
Heart and blood



Digestive System
Primary organs: mouth, stomach, intestines, rectum
Accessory organs: teeth, tongue, liver, pancreas

Muscular System
Muscles

Nervous System
Brain, Spinal Cord, Nerves

Reproductive System

Respiratory System
Lungs, nose, trachea, bronchi

Skeletal System

BrainPop Short: Nervous System

BrainPop Short: Respiratory System

Indicators 2.2, 2.4 – 2.7, 6.5

Section 2: Heredity

Heredity—the passing of characteristics from one generation to the next, is one of the processes carried on by all living things. All living things move, grow, change, ingest nutrients, reproduce, dispose of waste, breath and die. Because all living things eventually die, there needs to be a way for the species to survive. This process is called reproduction. Through the process of reproduction the characteristics of the parents are passed to the offspring.

Gregor Mendel (1822-1884), an Austrian monk and biologist, showed that patterns of heredity reflect the transmission of coded information from parents to offspring. This information is recorded on chromosomes. Before the turn of the 20th century chromosomes were not thought to have any role in heredity.

Later Wilhelm Johannsen called the units of heredity *genes*. The gene is part of the DNA molecule that carries the instruction for producing a specific trait like eye color. Different forms of the same trait are called alleles.

In 1879 Walther Flemming was the first person to observe chromosomes. Thirty years later Walter Sutton proposed that genes were located on the chromosomes.

Humans have 46 chromosomes in 23 pairs, in most cells. A typical chromosome contains thousands of genes.

Sometimes genes are damaged or copied incorrectly. These changes are called mutations. Mutations act as a source of variation that is needed for a species to adapt to changing conditions or a new environment.

Indicators 2.2, 2.5, 2.6

Cell Division

All life starts as a single cell. Some organisms, like an amoeba or a bacterium, remain one cell. Many others develop into complex beings consisting of many cells of different types. The body of an adult human has around 25 trillion red blood cells alone and produces millions of new ones every second as old cells wear out and die.

How does one cell become many? How do cells become blood cells, nerve cells or muscle cells? How do different cells become organized into tissues, organs and body systems? These are some of the questions explored by the video we will watch, "Cell Division."

After the video we will be watching the following BrainPops…

BrainPop Short: Fertilization

BrainPop Short: Pollination

BrainPop Short: Twins

BrainPop Short: Plant Growth

___/ 5
(p.24)

Name:_____ Class Period _____

Indicators 2.2, 2.5 & 2.6

Short Video (17min 57sec): Cell Division

Directions: Below, write 5 facts from the movie.

(1) _____

_____

(2) _____

_____

(3) _____

_____

(4) _____

_____

(5) _____

_____

___/ 15 SA
(p.25-26)

Indicator 2.7 & 6.5

Peas in a Pod Lab

Remember Gregor Mendel from the reading at the beginning of section 2? Gregor Mendel's contribution to the field of genetics evolved from his study of pea plants. He noticed that the pea plants varied in height. Some had yellow seeds, some green. The seven traits he studied were stem length, flower position, seed shape, seed color, seed coat color, pod shape, and pod color. Most of his experiments were aimed at trying to determine how these traits were passed on. Mendel noticed that generation after generation tall pea plants always produced tall plants. Yellow seeds always produced yellow seeds. Eventually he discovered that tall plants crossed with short plants produced tall plants, but in the second generation ¼ of the plants produced were short plants.

Materials

- Peas in pods
- Rulers
- Balance
- White glue/double sided sticky tape

Draw a picture of the closed pea pod.

Draw a picture of the open pea pod.

	Pea	Color	Size	Weight	Other Observations
1					
2					
3					
4					
5					

Peas in a Pod Lab Questions (continued…)

After you have recorded your observations about your pea pod. Compare your observations with the members of your group. View their pea pod and their observations.

(1) Give at least 3 similarities between your pea pod and the pea pods of the members of your group.

_____

_____

_____

_____

(2) What are at least 3 things that are different about your group members pea pods than yours?

_____

_____

_____

_____

(3) How are the peas in the class like the students in the class?

_____

_____

_____

_____

(4) What characteristics of the peas do you think are inherited? And what characteristics do think are not inherited?

_____

_____

_____

BrainPop Short: Genes

BrainPop Short: Heredity

Name:_____ Class Period _____

Indicators 2.5 – 2.7, 6.4 & 6.5

Short Video (24min 11sec): Genes, Genetics and DNA

1) What is it called when an egg joins a sperm cell.

2) How many chromosomes are found in human egg and sperm cells?

3) How many chromosomes does a human zygote have?

4) Where are chromosomes found in multi-cellular organisms?

5) How many sperm cells are permitted to penetrate an egg?

6) What is another name for cell division?

7) Who was the Austrian monk to discover the rules of heredity while working with pea plants?

8) What is a dominant trait?

9) What do you call an organism that possesses two dominant or two recessive genes for a single trait?

10) What do you call an organism that possesses one dominant and one recessive gene for a single trait?

11) What do you call the type of diagram that assists you in predicting the traits of offspring?

12) What are chromosomes made of?

13) What woman, along with Francis Crick, James Watson, and Maurice Wilkins, is credited with helping to discover the structure of DNA?

14) What are the initials of the four chemical bases found in DNA?

Extra Space…

DNA

The following words, explanations, and pictures are courtesy of www.thetech.org by EPIC: Electronic Publishing Instructional Curriculum at the University of California, Santa Cruz.

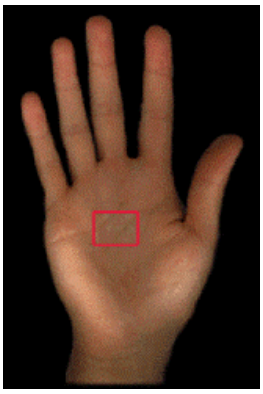
- DNA tells your body how fast your hair will grow.
- DNA tells your body how big to make your feet.
- DNA tells your body to put your skin on the outside.
- DNA even tells your body to build your brain.

DNA: An Instruction Manual for Building a Body

Building a person is no sleight-of-hand magic trick. Building a person involves following a set of instructions. Your body stores those instructions in a long, twisted molecule, DNA. It controls everything about the way you look, from the color of your eyes to how tall you are to the width of your feet. You carry billions of copies of those DNA instructions.

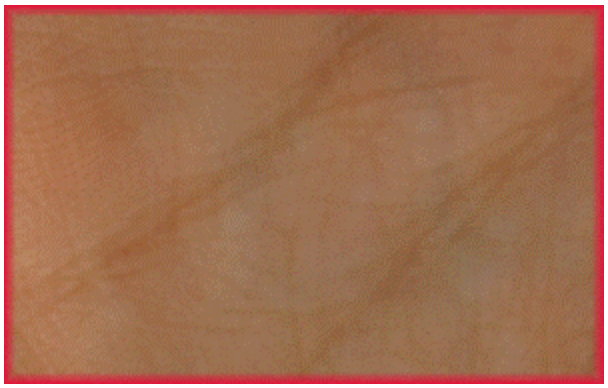
A Handful of DNA

This hand contains a lot of DNA, but you can't see this twisted stuff yet. You'll have to take a closer look.



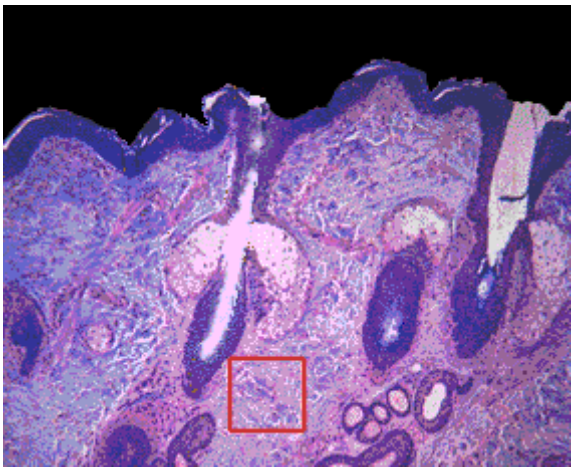
Zoom in on Skin

The more closely you look at the hand, the more details you'll see. Now you can see the wrinkles running across the palm of this hand. But, you can't see the DNA yet. You'll have to zoom in some more.



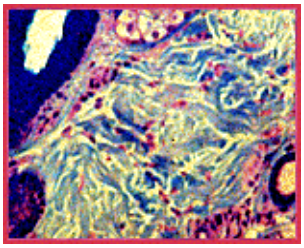
Looking Skin Deep

Tiny building blocks called **cells** make up your skin, and every other part of you. Thousands of cells surround every hair growing out of your skin. You can barely see the cells in the light purple area at the base of the growing hair below. To find the DNA, you'll have to look more closely at those skin cells.



Seeing Cells

Different kinds of cells make up different parts of your body. You have fat cells, muscle cells, and skin cells. If you look closely you can see the dark-staining nucleus of these cells. The DNA is smaller still....

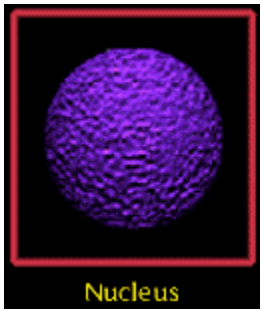


Single Cell

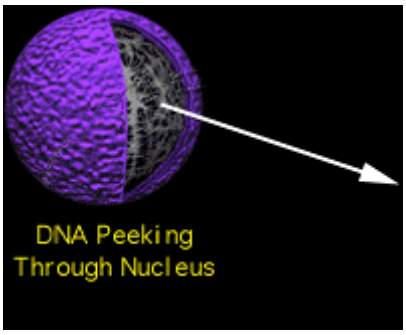
There is DNA in nearly all of your cells, held in a sack called a nucleus. A nucleus is like the brain of the cell. It is where the cell stores all of the information it needs.

Cell Center

This is the nucleus all by itself. In order to continue our search for DNA, we must continue inside of the nucleus.



Inside the Nucleus



If you made a little hole in the nucleus sack, you would see DNA peeking through. If you took away the outside of the nucleus, the DNA would spill out like spaghetti. Stretched out, the DNA from one cell would be as long as the height of a tall man.

Coiling Chromosomes

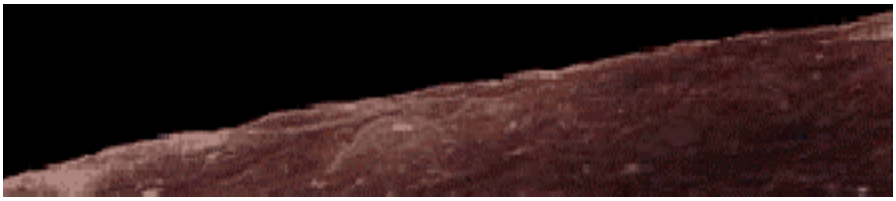
Sometimes cells use a kind of fork to wind up their DNA spaghetti into structures called chromosomes. In this picture, notice how the DNA from the previous page is coiling into an X shape. That X shape is a picture of a chromosome taken with a very powerful microscope. Although chromosomes are not always in this perfect shape, they are often represented as "X"s.

Chromosomal Character

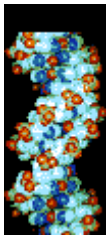
Chromosomes aren't really colored, but special stains show bands that scientists use as landmarks. Because chromosomes are formed from DNA, they contain the information for building more cells. There is a tremendous amount of DNA wound up the chromosomes, and a tremendous amount of information, too....

A Tale of Tall DNA

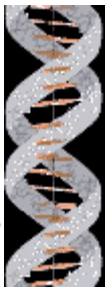
If you unraveled all your chromosomes from all of your cells and laid out the DNA end to end, the strands would stretch from the Earth to the Moon about 6,000 times.



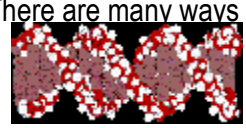
DNA Spirals



What does all that DNA look like? In the 1950s, James Watson got a look at an X-ray image, much like this one, taken from DNA crystals. From the pattern of spots on the image, he concluded that DNA must be a spiral, or helix shape.



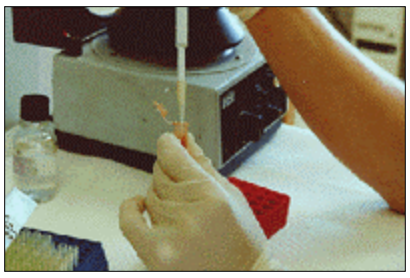
Watson and Francis Crick figured out that DNA looks like two threads twisted around each other, held together by many bridges between the strands. You could think of it as a spiral staircase. This shape is called a double helix. There are many ways of looking at the double helix.



Rosalind Franklin

Rosalind Franklin (1920-1957) produced the first usable X-ray pictures of DNA ever taken. Watson used her pictures to determine that DNA spirals into a double helix. She was not included in the publication that reported the structure of DNA and she died before the Nobel Prize was given to Watson and Crick. Scientists still debate whether she would have shared the prize with them had she lived.

What does DNA look like -- without a microscope?

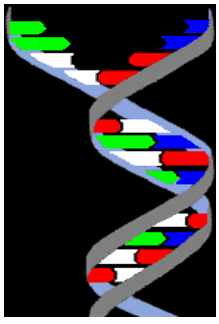


When scientists are working with DNA, their friends tease them they are just moving water back and forth. DNA dissolves in water, just like sugar or salt, and makes a clear, colorless solution. One little tube like the one in the scientist's hand can hold DNA from billions of cells.

DNA is Information?

How can a chemical contain information? Looking at the DNA shape from the outside, DNA appears to be pretty boring. It just goes on and on... Until the structure was figured out, many scientists thought DNA was too simple and could not be the Instruction Manual for the body. DNA is actually an endless march of characters in a 4-letter alphabet, but you don't see that until you open up the helix and look inside....

Information Helix



If you could pull apart the double helix, you would see the exposed ends of four different chemicals waving in the air. Those four chemicals, called bases carry the information used to make a body and to keep it running.

Scientists named each of the four bases with a letter, G, A, T or C. All of the letters in one cell make up the human **genome**, a complete set of instructions for making a person.

In a complete helix, the A's always line up with the T's and the G's with the C's. In the picture, the white and red bases always hook up together and blue and green are always together.

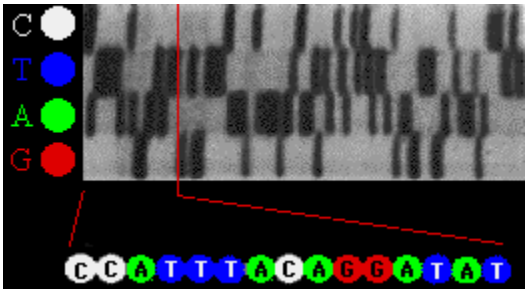
___/ 6
(pp.32-33)

Reading DNA
Here you can see how the bases of a helix become a DNA sequence.

When you write a letter, you put together words using different letters of the alphabet. With twenty-six letters you can say anything you want. It is important that the letters go in the right order. This sentence stops making sense whenthaliekrnviserhflker are in the wrong order.

When you make new cells, your body is putting together different letters of the DNA alphabet. Even with just four letters, the DNA alphabet spells out all of the information you need to create new cells and to stay healthy. The order of the DNA bases is called the sequence. Just like the order of the letters in a sentence, the sequence of the bases in DNA can spell all the instructions for your body -- even with only four letters.

Sequences Matter
Scientists figure out the order of bases in a piece of DNA from an X-ray film like this. This is called sequencing. Each dark band on the X-ray ladder matches a colored base. Each row of bands corresponds to one of the four bases. You can read the sequence from left to right, in order.



Right now, scientists are trying to sequence every base in a human cell. They're trying to create a complete map of the human genome. With this information they hope to cure disease.

Finding a Sequence in the Genetic Haystack
If you wrote down all of the bases in one cell, you would fill a stack of 1,000 phone books with A's, T's, G's and C's. Scientists trying to locate small sections of DNA out of the whole genome have to flip through billions of bases to find what they want! Sometimes this takes years.
If you have the Shockwave plug-in, you can play "Search for the Sequence." with a very SMALL sequence.

1) Ethics
Many scientists are working on reading and manipulating the information in DNA. Their discoveries bring up many ethical dilemmas. The following scenarios ask your opinion on fictional situations. After you respond to the dilema, you can see the answers of other people who came before you. The survey is in no way scientific. It is meant to encourage future thought on the subject.

Moral dilemmas and Surveys

2) You are a Parent
You and your partner have been trying to have a girl for 15 years. Instead, you have had five boys. At a very early stage of pregnancy, you discover another boy is on the way. If there was a genetic treatment to change the gender of your fetus, would you use it? Write your thoughts below.

3) You are the Doctor.
Your patient has a family history of colon cancer. Physical examinations indicate that she does not have the cancer. Nevertheless, your patient is still worried and requests genetic tests. The results of the test indicate that there is a 15% chance your patient will develop colon cancer in the next twenty years. It is your job to advise your patient. You do not want to alarm your patient about these inconclusive results. Do you tell her that she is at risk? Write your thoughts below.

4) You are the Patient.
When you were just a baby, your grandfather died of Huntington's disease. Huntington's is a debilitating mental disease that develops in middle age and often results in death before the age of 50. Unfortunately, there is no known cure for the disease. You know that there is a chance that you carry the Huntington's gene. There is a simple genetic test that can determine whether you are a carrier.
Do you get tested? or is ignorance bliss? Write your thoughts below.

5) You are the Judge.
You have just finished listening to the closing arguments of a trial and you retreat to your chambers to make a decision. The attorneys for the insurance company argued that genetic profiles should be available for review by insurance companies. They asserted that insurance companies have a right to know about the pre-existing conditions of their clients, including the genetic pre-disposition to develop a disease. If insurance companies remain ignorant of genetic profiles, individuals without genetic flaws will be forced to subsidize the cost of those who develop genetic diseases.

The attorneys from the American Civil Liberties Union (ACLU) challenged the insurance company's argument. The ACLU asserts that genetic information is private. The fifth amendment protects the privacy of all individuals, and genetic privacy is no exception. If genetic information was made public, individuals with genetic flaws would face discrimination from insurance companies and employers.
You ponder the evidence for several hours. Now it is time to make a decision. Do you rule in favor of the Insurance company or the ACLU? Write your thoughts below.

6) You are the Voter.
The year is 2010. You are preparing to vote on a new bill that requires all citizens to provide blood samples to the local police department. The samples will be used to create a database of genetic information. The police will use the database to identify and apprehend crime suspects and clear innocent people of crime charges. Proponents of the bill argue that it is an essential step in the war against crime. Opponents claim that the information will be misused and that genetic information should remain private. Do you vote in favor of the new bill?

Indicators 2.4, 2.6, 2.7, 2.8, 6.4 & 6.5

What Makes a Dog?

By Emily Sohn

E-mail this article

Print this article

April 28, 2004

Dogs are like ice cream flavors: There's one to satisfy nearly every taste.

Choose a size, say. A St. Bernard can weigh 100 times more than a Chihuahua. Or pick the type of coat. Poodles have long, curly hair; pugs have smooth, short coats. Or select just about any other quality. Greyhounds are lean and fast. Pit bulls are stocky and powerful. Some dogs are dumb. Others are deadly. Some protect you from burglars. Others rip your couch to shreds.

A golden retriever takes it easy.
Eric Roell

Two dogs can look and act so differently that you might think that they belong to separate species—that they're as distinct as, say, a rat and a kangaroo.

Nonetheless, as unlikely as the mismatched couple may seem, a tiny terrier and a giant Great Dane still belong to the same species. As long as one is male and the other is female, any two dogs can mate and create a litter of puppies that look like a mix of the two breeds. Dogs can even mate with wolves, jackals, and coyotes to produce offspring that can grow up and have their own babies.

To explain how and why dogs can differ in so many ways yet still belong to the same species, scientists are going straight to the source: dog DNA.

Instruction manual

DNA is like an instruction manual for life. Every cell contains DNA molecules, and these molecules include genes, which tell cells what to do. Genes control many aspects of an animal's looks and behavior.

This spring, researchers from the Whitehead Institute for Biomedical Research in Cambridge, Mass., expect to complete a detailed scan of the entire set of DNA in a boxer named Tasha. They'll be able to compare the boxer's DNA to that of a poodle. A different group of scientists analyzed a poodle's DNA last fall (see http://sciencenewsforkids.org/articles/20031001/Note3.asp). Others are starting to work on DNA belonging to each of three other dogs: a mastiff, a bloodhound, and a greyhound.

Scientists are analyzing the DNA of Tasha, a female boxer.
NHGRI

A wealth of important information lies within the genes of dogs. Already, analyses of dog DNA are helping to explain when and how wolves first left the wild and became pets. In the future, pinpointing which genes do what may help breeders create calmer, cuter, or healthier dogs.

The health of people may be at stake, too. Dogs and people suffer from about 400 of the same diseases, including heart disease and epilepsy, says Norine Noonan of the College of Charleston in South Carolina.

Dogs may be helpful for studying a variety of human diseases. It's not even necessary to keep dogs in the lab, says geneticist Gordon Lark of the University of Utah in Salt Lake City. A simple blood test or saliva sample is enough for researchers to extract DNA for analysis.

"Cancer is the number one killer of dogs after age 10," Noonan says. "By understanding cancer in dogs, perhaps we can find a window into understanding cancer in humans."

"This is the current disease frontier," Lark says.

Dog diversity

Belonging to as many as 400 different breeds, dogs are perhaps the most diverse species of animal on Earth. They're also one of the most vulnerable to ailments, having more genetic problems than nearly any other animal.

These problems spring in large part from the breeding process itself. To create a new type of dog, a breeder typically mates dogs that share a particular trait, such as snout length or running speed. When puppies are born, the breeder selects the ones that have the longest snouts or run fastest to mate in the next round. This goes on for generations, until a new breed of long-snouted or super-fast dogs makes its way into competitions and pet stores.

By choosing dogs that look or act a certain way, the breeder is also choosing genes that control those traits. At the same time, though, genes that cause diseases can get concentrated in the population. The more closely related two animals are, the higher are the chances that their offspring will suffer genetic diseases or other problems.

Border collies, known for their intelligence and working ability, were bred to herd sheep.

Different breeds tend to have different problems. Greyhounds' very light bones make them fast, but a greyhound can break its legs just by running. Dalmatians often go deaf. Heart disease is common in boxers. Labradors have hip problems.

In January, researchers in the United Kingdom started to survey how common dog diseases are in various breeds. With the hope of designing better screening and treatment programs, the scientists have asked more than 70,000 dog-owners to provide information about their dogs.

Best friend

Studying dog genes may also help explain when and how dogs became "man's best friend."

No one knows for sure how it happened, but one popular story goes like this: About 15,000 years ago in central Russia, our ancestors were sitting around a fire. A particularly brave wolf crept closer and closer, drawn by the smell of food. Feeling sympathetic, someone threw a leftover bone or scrap of food to the animal.

Eager for more food, the wolf and its pals began to follow human hunters from place to place, flushing out game for them. As a reward, people took care of the animals and fed them. Eventually, wolves moved into the human community, and a relationship began. Tameness was the first trait people selected for. Different shapes, sizes, colors, and temperaments came later. The modern dog was born.

The Chesapeake Bay Retriever is known as an intensely loyal, protective, sensitive, and serious working dog.
Shawn Sidebottom

Recent genetic analyses suggest that domestication probably happened independently in six places in Asia, says Deborah Lynch of the Canine Studies Institute in Aurora, Ohio.

Some researchers speculate that wolves may have tamed themselves simply by hanging around Stone Age garbage dumps. Wolves that weren't scared off by people had a better chance of getting food and surviving.

There's also genetic evidence suggesting that tameness itself goes together with changes in body chemistry that allow for a greater variety of body shape, coat color, and other traits among dogs.

Solving problems

New information about dog genetics is helping scientists find ways to rid dogs of certain undesirable types of behavior.

Burmese mountain dogs are one example, Noonan says. The muscular dogs used to be extremely aggressive. Through a careful study of heredity, scientists tracked down a gene responsible for this aggression and bred dogs that don't have it.

Other behaviors may be more difficult to chuck out. "We know of no genes for peeing in the house or chewing up shoes," Noonan says.

Some things may never change.

___/ 3
(p.38)

Question…
What did you find most interesting about the article, "What Makes a Dog?" and why did you find that interesting?

_____

_____

_____

_____

_____

BrainPop: DNA

Indicator 2.4, 2.5, 2.7, 6.4 & 6.5

Animal Clones: Double Trouble? Article

Emily Sohn

E-mail this article

Print this article

Jan. 28, 2004

Have you ever had a hamburger so good you wished you could eat the same thing all over again?

With the way that cloning research is going, you might someday get your wish. The United States government recently decided that it's safe to drink milk and eat meat that comes from cloned animals. The decision has inflamed arguments about human health, animal rights, and the difference between right and wrong.

Clones, like identical twins, are exact genetic copies of each other. The difference is that twins turn up without scientists' being involved and are born at the same time. Clones are created in the lab and can be born years apart. Already, scientists have cloned 11 kinds of animals, including sheep, cows, pigs, mice, and horses.

Dolly the sheep was the first mammal to be cloned from the DNA of an adult. Here she is with her first-born lamb, Bonnie.
Roslin Institute, Edinburgh

As researchers continue to refine their techniques and clone even more animals, some people are worried. So far, cloned animals haven't fared well, critics say. Few cloning attempts are successful. The animals that do survive tend to die young.

Cloning raises a variety of issues. Is it a good idea to let people clone a favorite pet? What if cloning could revive the dinosaurs? What would happen if scientists ever figure out how to clone people?

Still, research continues. Scientists who study cloning envision a limitless supply of disease-resistant livestock, record-setting racehorses, and animals of species that would otherwise have gone extinct. The research is also helping scientists learn more about the basics of development.

How cloning works

To understand how cloning works, it helps to know how animals normally reproduce. All animals, including people, have a set of structures in each cell called chromosomes. Chromosomes contain genes. Genes are made of molecules known as DNA. DNA holds all the information necessary to keep cells and the body working.

Humans have 23 pairs of chromosomes. Cows have 30 pairs. Other types of animals may have different numbers of pairs.

When two animals mate, each offspring gets one set of chromosomes from its mother and one from its father. The particular combination of genes that you happen to get determines a lot of things about you, such as the color of your eyes, whether you're allergic to pollen, and whether you're a boy or a girl.

Parents have no control over which genes they give to their kids. That's why brothers and sisters can be so different from one another, even if they have the same mom and dad. Only identical twins are born with exactly the same combination of genes.

The goal of cloning is to take control of the reproductive process. "You are taking out all the randomness," says reproductive physiologist Mark Westhusin, "by selecting a specific combination of genes to get what you want."

Dewey, the world's first deer clone, was born May 23, 2003.

Courtesy of the College of Veterinary Medicine, Texas A&M University.

That's appealing to people who breed horses, dogs, or other animals for competition. It would be nice to preserve the combination of genes that make a horse fast, for instance, or a dog's coat especially curly. It might also be possible to use cloning to save endangered animals if there are too few of them to reproduce well on their own.

Farmers also have an interest in cloning. The average milk cow produces 17,000 pounds of milk a year, says Westhusin, who works at Texas A&M University in College Station. Every once in a while, a cow is born that can naturally produce 45,000 pounds of milk a year or more. If scientists could clone those exceptional cows, fewer cows would be needed to make milk.

Cloning could save farmers money in other ways, too. Livestock are particularly vulnerable to certain diseases, including one called brucellosis. Some animals, though, have genes that make them naturally resistant to brucellosis. Cloning those animals could produce a whole herd of disease-free animals, saving farmers millions of dollars in lost meat.

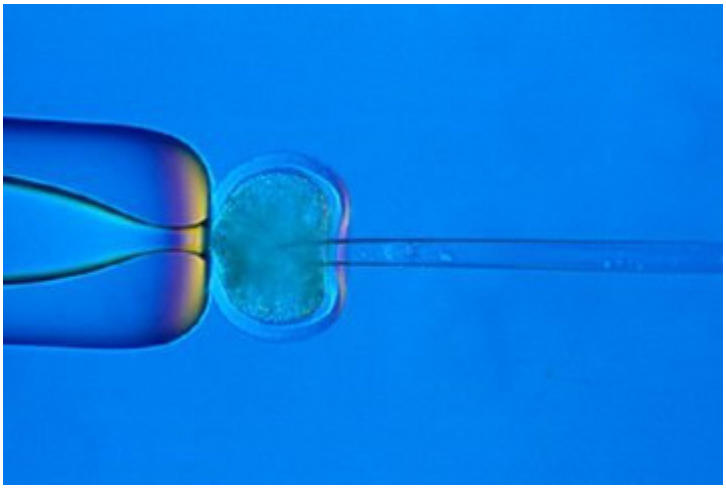
With an endless supply of healthy, fast-growing animals, we might worry less about getting sick ourselves. Farmers wouldn't have to pump their animals full of antibiotics, which get into our meat and, some people think, make us unable to respond to those antibiotics when we become ill. Perhaps we could also protect ourselves against diseases that jump from animals to people, such as mad cow disease.

Kinks in the process

First, though, there are plenty of kinks still to be worked out. Cloning is a delicate procedure, and lots can go wrong along the way. "It's really quite remarkable that it works at all," Westhusin says. "There are lots of ways we know it doesn't work. The more difficult question is to figure out how sometimes it does."

Westhusin is one of many researchers working hard to answer that question. His experiments focus mostly on goats, sheep, cattle, and some exotic animals, such as white-tailed deer and bighorn sheep.

To clone an animal, such as a cow, he starts by removing the chromosomes from a regular cow's egg. He replaces them with chromosomes taken from a skin cell belonging to another adult cow.



Cloning involves removing the chromosomes from an animal's egg cell and replacing them with chromosomes taken from a cell belonging to a different adult animal.
Roslin Institute, Edinburgh

Ordinarily, half the chromosomes in an egg would have come from the mother and half from the father. The resulting combination of genes would be entirely up to chance. With cloning, all of the chromosomes come from just one animal, so there's no chance involved. An animal and its clone have exactly the same genes.

When the egg starts dividing into an embryo, Westhusin puts it into a surrogate mother cow. The mother doesn't have to be the same cow that provided the skin cell. It just provides the womb for

the clone to develop. If everything works just right, a calf is born, looking and acting just like a normal calf.

More often than not, however, things don't work out quite right. It may take 100 tries to get one embryo to develop inside the mother, Westhusin says.

Dying young

Even if they make it to birth, cloned animals often seem doomed from the start. For reasons scientists don't yet understand, cloned baby animals often resemble animals born prematurely. Their lungs aren't fully developed, or their hearts don't work quite right, or their livers are full of fat, among other problems. As they age, some clones grow hugely overweight and bloated.

Many cloned animals die at an earlier age than normal. Dolly the sheep, the first cloned mammal, died after only 6 years from a lung disease rare for sheep of her age. Most sheep live twice that long.

These three mules are genetically identical. University of Idaho scientists used genetic material from the same male mule to create three embryos. They implanted the embryos into surrogate mother mules 1 month apart, so one was born last May, another was born last June, and the third one was born last July.
J. Miller

The problem, Westhusin thinks, is in the genes. Even though a skin cell has the same chromosomes as every other cell in the body, certain genes get turned on or off when a cell becomes specialized during development. That's what makes a brain cell different from a bone cell different from a skin cell. Scientists haven't yet figured out how to completely reprogram an adult cell's genes to recreate an entire animal.

Yesterday, they were acting like skin cells," Westhusin says. "Today, you're asking them to activate all their genes and start life all over again. You're asking them to turn genes on that normally wouldn't be turned on."

There's a lot to be learned from these complications. "Studying what goes wrong," Westhusin says, "can give us clues and keys to what happens in nature. It's a model of development that shows how genes are reprogrammed."

Such complications also suggest why it might not be a good idea to clone a beloved pet. Even if a clone is nearly genetically identical to the original, it will still grow up with its own personality and behavior. Because of differences in diet before birth and as it grows up, it could end up a different size and have a different pattern of coat color. There's really no way to get a favorite pet back through cloning.

Clone chops

Even though cloning technology is far from perfect, milk and meat from cloned animals should be safe, Westhusin says. And the U.S. government agrees.

"There's no reason to believe, based on how clones are produced, that there are any food safety issues involved," Westhusin says. Cloned food products might appear on supermarket shelves in the near future.

Still, the thought of eating cloned creatures just doesn't sit right with some people. In a recent article in the *Washington Post* newspaper, science reporter Rick Weiss wrote about the old saying, "You are what you eat," and what that might mean for someone eating "clone chops."

"The whole prospect left me inexplicably disgusted," Weiss wrote. Though he admitted his reaction might be partly emotional, he didn't like the idea of a world where identical animals are produced like food pellets in a factory. "Is my dream of Compassionate Cold Cuts a rational one?" he asked.

That may be a question you'll have to answer for yourself some day not too long from now.

Question…
What did you find most interesting about the article, “Cloning?” and why did you find it interesting?

_____

_____

_____

_____

_____

BrainPop: Clone Dolly Sheep

___/ 10 SA
(p.44)

Indicator 2.1, 2.4 & 2.7

Extracting DNA

1) Pick a source to extract DNA from. You can choose from onions, broccoli, split peas, or chicken liver.

2) Mr. Brown will blend your choice with twice as much cold water and a pinch of salt.

3) Mr. Brown will poor the blended mixture through a strainer and give you some in a test tube.

4) Add Ajax soap to your mixture. Add 1/6 the amount of mixture that you have in your test tube.

5) Let it sit for 5-10 minutes. Be sure that you look at the clock so you know when to go to the next step.

   ✓ **While you wait, answer these questions**
   a. Do you think you'll be able to see any DNA? Why?

   b. Assuming you can see DNA, what do you think it will look like? Why do you think this?

   c. What is DNA, and what does it do?

6) After you have waited 5-10 minutes, add a pinch of meat tenderizer. This will act as an enzyme to break up the proteins. **Don't stir hard because you will break up the DNA, making it harder to see!**

7) Tilt your test tube and slowly pour rubbing alcohol into the tube down the side so that it forms a layer on top of your mixture. Pour until you have about the same amount of alcohol in the tube as your mixture.

8) DNA will rise into your alcohol layer. You will need to use a stick or straw to pull the DNA up into the alcohol. The DNA usually sits right at the base of the alcohol.

   ✓ Draw a picture of what you see →

   ✓ Describe what the DNA looks like.

_____

_____

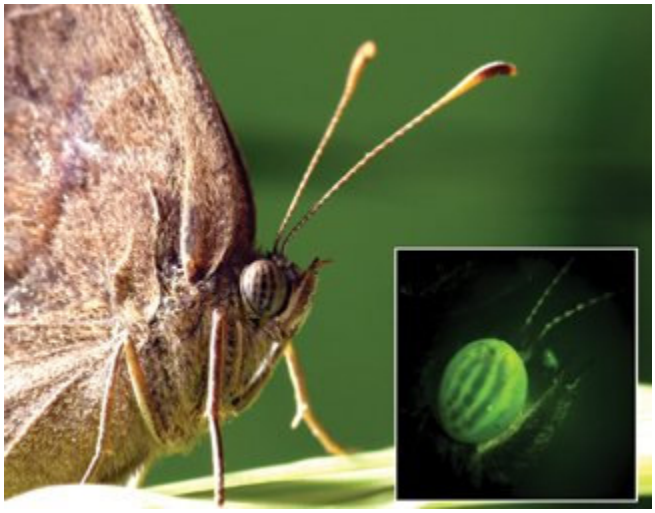
_____

A Butterfly's New Green Glow
By Emily Sohn

Indicator 2.4, 2.7, 6.4 & 6.5

___/ 3
(p.45)

The colorful patterns on a butterfly's wings can be mysterious and beautiful. Add a jellyfish gene to a butterfly's genetic makeup, and the result might be even more awe-inspiring.



The brownish eye of this African tropical butterfly glows green when exposed to ultraviolet light (inset) after scientists added a jellyfish gene to the butterfly's genetic makeup.

The jellyfish gene directs production of a chemical compound that glows green when exposed to blue or ultraviolet light. In an African butterfly, addition of this gene makes the butterfly's eyes glow green.

All cells contain long, complicated molecules called DNA. This material provides the instructions that determine what a cell is like and control what a cell does. A gene is a piece of a DNA molecule that has a particular function, which can be passed on from parents to offspring.

In their butterfly experiment, researchers from the State University of New York at Buffalo and Western Kentucky University started with a gene—a snippet of DNA—that allows jellyfish to produce a chemical compound that glows green. They put this DNA snippet into each of more than 10,000 butterfly eggs. About 5 percent of the eggs survived.

Of the eggs that survived and developed to adulthood, about 15 percent had offspring with glowing green eyes when researchers looked at them under ultraviolet light. Our eyes can't see the green glow on their own.

This was the first time that researchers had successfully changed a butterfly's genetic makeup. Others had previously added jellyfish genes to create glowing green eyes in houseflies and some other insects.

Now that they know it's possible, scientists want to try to change butterflies in other ways. One goal is to understand how genes control the development of spots on the insects' wings.

There may be as much information and biology as beauty and mystery in those dramatic streaks of color flitting by on a sunny spring day.—*E. Sohn*

Question…
What did you find most interesting about the article, "Cloning?" and why did you find it interesting?

_____

_____

_____

Ask a Geneticist

Indicator 2.4, 2.7 & 6.4

by Dr. Barry Starr, Stanford University

Is it possible to create a picture, like a photo, of a person by using that person's DNA? Is there any research being done in this area?

What a cool question! I never thought of something like this even though I probably should have. I would love to see what Genghis Khan or a Neanderthal really looked like.

If DNA is really the blueprint or recipe for making you, it sure seems like it should be possible to create a picture from it. But it probably isn't. At least for now, our understanding of our genes just isn't advanced enough to be able to paint a picture of who we are. Besides, our DNA also couldn't tell us what the environment has done to how we look.

To really generate a photograph from our DNA, we would need to have an understanding of our genes that we just don't have right now. We can't even look at someone's DNA and tell what color eyes or hair (except maybe red) they will have.

But let's say we gained a deep understanding of our genes and how they interact with one another…could we create a picture of someone?

One thing is for sure; we could not create a picture of you as you are now. The instructions in DNA really are a recipe for making you. What looking at someone's DNA can't necessarily do is tell us about how the environment affected the instructions.

How we look and who we are is more than our DNA. A simple thing like how much protein someone has while growing up will affect how tall he or she is as an adult, for example. There are probably other factors like what we ate, where we lived or what we did while in the womb and growing up that might affect the way we look too.

Maybe our DNA could tell us what we'd look like if we'd grown up in a vacuum. Even then I'm not sure.

Lots of things happen in our cells that are not necessarily the result of our DNA. Our genes tell us what to make, the environment can affect how much of something a gene makes.

For example, in a male, all the instructions for becoming a male are in the DNA. However, without testosterone, they won't get turned on enough to turn a boy into a man (or for that matter, a fetus into a boy).

Testosterone is turned on early in development and then again, at puberty. Without this switch to turn on a bunch of genes, maleness just doesn't happen. Sort of like turning on the oven when you're baking cookies—if the oven isn't on, the cookie dough doesn't turn into cookies even if all the ingredients are there.

Of course, this doesn't mean we can't learn a few interesting things about how some long dead folks looked. For example, a study being done on German fossils showed that red hair was pretty uncommon 3000 years ago. That is all we know so far because red hair is the only trait we can easily screen for right now.

Well, I hope this answered your question. As you can see, we probably won't be able to sketch any portraits of people from their DNA any time soon. But we may learn interesting facts about how our ancestors may have looked.

Indicator 2.4 & 2.7

Heredity and Environment

There are two primary influences acting together throughout one's life—heredity and environment. Heredity is the passing on of traits from one generation to the next. Environment includes all of the other forces that act on an organism.

It is difficult to tell in many cases where the effects of heredity and those of environment begin and end.

A species is a group of organisms that resemble one another and are potentially able to breed with each other. In many ways, members of a species are alike. They carry genes for certain traits called specie traits. Walking standing up is a species trait for human beings.

Individual traits cause members of a given species to be different from each other. Such traits include hair and eye color.

Directions: Below, fill in the table with traits that you believe are inherited and traits that you believe are not inherited but are learned. The first one in each column is done for you.

Inherited Traits	**Non-inherited Traits (learned)**
Hair color	Table manners

___/ 3
(p.48)

Indicators 2.4 & 2.7

Population Sampling

People have many inherited traits. Some can be seen, some can't. Some traits are classified as dominant, some as recessive. For example, freckles and dimples are causes by dominant genes. Attached earlobes are recessive traits. Even if both parents have detached earlobes, it is still possible for the offspring to have the recessive trait because each parent could be carrying the recessive gene.

The following traits are inherited traits…
Widow's Peak—hairline that comes down to a peak in the middle of the forehead

Freckles—small redish brown spots on the skin

Attaches earlobes—tips of earlobes completely attached to the side of the head

Cleft chin—indentation in the middle of the chin

Dimples—small indentations in the cheeks

Tongue rolling—ability to roll the edges of the tongue up on each side

Directions: Keep a tally in the following table of the number of class members that have each trait.

Trait	# of Class Members with…
Widow's Peak	
Freckles	
Attached earlobes	
Cleft Chin	
Dimples	
Tongue Rolling	

BrainPop Short: Photosynthesis
This BrainPop will help us to make good observations in the Corn Sprout Lab.

BrainPop Short: Food Chains
After watching this BrainPop, think about where on the food chain our corn plants are.

___/ 20 SA
(p.49)

Indicator 2.4, 2.7 & 6.4

Corn Sprout Lab

We are going to sprout some corn seeds as a class. Each day we will observe and record our observations. Remember to keep clear, thorough and accurate records.

Date:	Date:	Date:	Date:	Date:	Date:	Date:
(Picture) Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:
Date:	**Date:**	**Date:**	**Date:**	**Date:**	**Date:**	**Date:**
(Picture) Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:
Date:	**Date:**	**Date:**	**Date:**	**Date:**	**Date:**	**Date:**
(Picture) Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:	**(Picture)** Extra Observations:

After the lab is completed, answer these questions…

1) Did your plant grow well? _____

2) Why do you think it grew well or didn't grow well? Be sure to give all the reasons you think so._

_____

_____

3) Did your plant grow as you expected? Why or why not?_____

_____

Indicators 2.7, 6.3 & 6.4

Science Class Crime Investigation

Some traits are inherited; some are not. Everyone has fingerprints, and these fingerprints are unique to each person. It doesn't matter what your parent's fingerprints are. As no two snowflakes are the same, there are no two fingerprints that are the same either. Fingerprints cannot be changed.

Materials

- non-toxic black ink stamp pad
- rubbing alcohol
- paper towels
- magnifying glass
- roll of 1 inch wide clear, sticky tape
- small watercolor brush
- charcoal powder

Directions: Make rolled impressions of each finger or thumb, by inking each one at a time, and rolling each finger and thumb onto the chart below.

Right Thumb	Right Index	Right Middle	Right Ring	Right Little
Left Thumb	**Left Index**	**Left Middle**	**Left Ring**	**Left Little**

Directions: Make plain impressions in the place below, by inking the four fingers of the hand and printing them together. Press the fingers flat against the paper. Do not roll them. Ink your thumb and press it flat against the paper.

Left Four Fingers	Left Thumb	Right Thumb	Right Four Fingers

Science Class Crime Investigation (continued…)

We will have a mock crime scene to show how these traits can help us to solve crimes. We will use charcoal powder, a watercolor brush and transparent tape in order to lift fingerprints from the crime scene.

Volunteers

Five suspects

Investigators

The students that are not suspects are the investigators. We will investigate fingerprints from the crime scene to determine who is guilty.

Question: Who do you think is guilty? Why?

_____

_____

_____

_____

_____

_____

How to lift fingerprints…

- Locate an area where you want to lift fingerprints from. Windows, mirrors, and glasses are good sources.
- Use a watercolor brush to carefully dust the charcoal powder onto the print.
- Using a piece of tape, carefully press it onto the dusted print. Make sure to cover the print smoothly. Lift the print.

Just as every human being has fingerprints that are unique, every human being has a DNA pattern that is unique. Scientists estimate that the chances of two human beings having the identical DNA pattern is approximately 30 billion to 1. Short segments of an individual's DNA are analyzed for the pattern. DNA fragments are treated with a radioactive substance that produces a pattern of stripes when exposed to x-ray film. The pattern created is unique for every human being. The patterns created resemble bar codes. These segments are sorted and categorized.

The DNA pattern is the same for each cell in the body. Therefore, a person's DNA pattern can be determined from a strand of hair, a drop of blood, or any cell of the body. DNA "fingerprints" have become popular recently in solving violent crimes.

Learning to Live Together Reading (from What Your Sixth Grader Needs to Know)

Sometimes species learn to live together, forming a special relationship called symbiosis. (The word *symbiosis* is Greek for "living together.") In a symbiotic relationship, two species live together in a way that is usually beneficial to one, sometimes to both. For example, pink lady's-slipper orchids have developed a symbiotic relationship with a species of fungus that grows with the plant's roots. The fungus helps the orchid by increasing the amount of water and nutrients it can take in. The orchid, in turn, serves the fungus by supplying it with carbohydrates.

This bumblebee is pollinating an aster as it gathers nectar, which is an example of a symbiotic relationship.

There are many other examples of adaptations for mutual benefit in the natural world. Ferocious sharks let tiny fish called *wrasse* survive by cleaning food from the sharks' sharp teeth. Small birds called plovers scamper into crocodiles' mouths to eat the worm-like leeches that stick to the crocodiles' jaws. Ants herd and protect small bugs called aphids because they love the honey-like liquid they can "milk" from their aphid "cows."

Some of the most colorful and unusual adaptations involve plants that have developed special structures for attracting pollinators (such as bees, birds, or butterflies) to their flowers. The pollinators benefit by having access to food in the form of nectar and pollen, and the plants benefit by having their pollen transferred from anther to stigma, so reproduction can take place. Before an insect can feast on nectar, it must brush up against an anther full of pollen. The pollen sticks to the insect and is either transferred to a sticky pistil, or carried on to the next flower's pistil, where it eventually fertilizes the flower.

Extinction

Although species can adapt to changes in their environment, adaptation usually takes a long time. Unfortunately, mankind has gained the ability to change the environment very quickly, and any times organisms cannot adapt quickly enough to survive these changes in the environment. When a whole species dies out, we say the organism has become extinct.

A great many animals and plants are threatened with extinction. Dolphins and whales, gorillas and wild elephants are now classified as endangered animals. In our county, the Florida manatee, the bald eagle, the peregrine falcon, and the California condor face extinction unless we control the fishing, hunting, and land development that threaten these animals and their habitats.

Behaviors of Living Things

Instinct

Just as organisms inherit genes for physical characteristics such as fur or petal color, they also inherit genes for certain behaviors. The simplest behaviors are reflexes: you inherited genes for a set of reflexes that cause you to blink your eyes in bright light, snatch your hand away from hot objects, or cough when you inhale smoke.

Animals also inherit genes for behavior patterns more complex than reflexes. These behaviors are known as instincts. Almost all animals inherit the instinct to stay alive. This instinct for self-preservation causes animals to seek food, water, and shelter and to defend themselves against enemies or to run form danger. Rabbits instinctually run when they see danger. Animals also inherit instincts to reproduce and to rear and protect their young. Other examples of instinctive behavior include hibernation and migration. Squirrels an chipmunks hibernate in winter. Birds migrate in winter by instinct.

Peregrine falcons like this one are on the endangered species list.

Here's how scientists tried to test for instinctive behavior in one interesting study. Adult herring gulls have beaks with red spots. Their chicks peck at the spot as a way of begging for food, and then the parents feed them. When scientists tried to use a simulated beak to feed herring gull chicks who had never been fed by their parents they found that the chicks begged for food only if the beak had a red spot on it. Because these chicks had never been fed by their parents they could not have learned this behavior. Scientists concluded that the chicks' behavior had to be instinctive.

Learning

An instinctive behavior is inherited: you're born with it. In contrast, a learned behavior is developed from experience. Although humans and some animals do inherit an instinct to learn, the content of their learning is determined by their experience.

Instinctive behavior does not change; it stays the same even when circumstances change. Birds migrate in the winter months even when the weather stays warm. But learned behavior is more flexible. Humans don't hibernate in winter, and most humans don't change where they live seasonally. Instead, they have learned to dress warmly and heat their houses. Humans are very adaptable. Generally we don't wait for evolution to change our responses to the environment; instead, learned behavior enables us to respond quickly to changing circumstances.

To learn from experience, an organism must have a memory to store information to be used later. Memory helps an organism learn through trial and error. In trial-and-error learning, an organism tries to d a task again and again, sometimes making mistakes, but other times succeeding. Eventually the organism figure out what it did to succeed. A mouse will learn how to get through a maze to find food at the end by trying different routes again and again. The mouse eventually remembers which routes don't lead to food and which do.

Animals learn not only by trial and error, but also learn by conditioning, which involves a system of rewards or punishments. If you have a dog, you and your parents probably trained it in this way. A Russian scientist named Pavlov once conducted a famous experiment in conditioning. Pavlov rang a bell very time he offered food to a group of dogs. The dogs would begin to salivate when they were fed. After repeating this action many times, Pavlov continued to ring the bell, but without feeding the dogs. He discovered that the dogs still began to salivate every time he rang the bell.

Conditioned behavior can lead to the development of habits. Habits are learned behaviors that are repeated so often they are performed almost without thinking. They seem almost instinctive. What are some of your good habits? What about bad habits?

Another way animals learn is through imitation. Some young birds learn to fly by imitating their parents. Young eagles learn to hunt by watching their parents an imitating them. You learned to speak by imitating the speech of other people.

BrainPop Short: Conditioning
This BrainPop will help us to further understand "learned" behavior such as conditioning.

BrainPop Short: Ecosystems
This BrainPop will help us to further understand how organisms interact.

Blotchy Face, Big-Time Wasp Article by Emily Sohn

Indicator 2.8 & 6.5

Winners never cheat, and cheaters never win." You may have heard people say this. Some wasps seem to live by the same motto.

A new study shows that if female paper wasps pretend to be something they're not, their peers get angry.

Some animals have colored markings, like badges, that show their status. High-ranking male house sparrows, for instance, often have a bigger dark patch of feathers on their breast than low-ranked birds do. The patch warns other birds to respect them.

Scientists have wondered why less dominant animals don't sometimes develop status markings

The varied markings on the face of paper wasp queens show the bearer's rank. A blotchier face means a higher status.

as a way to trick others into giving them more respect than they deserve. One possible explanation is that high-ranking animals must also prove themselves socially. Evidence for this idea, however, has been tricky to find.

Researchers from Simon Fraser University in Burnaby, British Columbia, went looking for some answers in paper wasps (*Polistes dominulus*).

Each colony of paper wasps has about 10 queens, who fight each other and end up ranked from top queen to all-around loser queen. All the queens have spots on their faces, but each queen has a different numbers of spots, and some spots have curvier edges.

The researchers found that queens with really spotty faces—with both lots of spots and lots of wavy edges—ranked higher that those with simpler patterns did. It's the first status badge ever found in an insect.

To test the risks of wearing badges, Elizabeth Tibbetts used model-airplane paint to change the number and curviness of spots on some of the queens. For comparison, she also dabbed paint on the faces of some other queens in places that didn't change the outline of the spots. Wasp faces are tiny, so she learned to paint very carefully.

Tibbetts then let regular wasp queens fight with the painted wasps. The fights where one wasp had the wrong spots for her rank went on much longer than fights involving a painted wasp who still had the natural outline of spots. This showed that faking spots could mean a lot of dangerous battles. The extra fighting might help keep the badge system honest.

With wasps, as with people, it seems, it's always best to be yourself. As the saying goes, "Honesty is a virtue."—*E. Sohn*

1. How do high-ranking male house sparrows show their ranking to other birds?

_____

_____

2. In Elizabeth Tibbett's study, what happened when she painted extra blotches on lower ranking queen wasps?

_____

_____

3. Do you think it's important that queen wasps fight to determine who has the highest ranking? Why?

___/ 4
(p.56)

Indicator 2.8 & 6.5

The Birds are Falling Article

It's time to start paying close attention to birds. That's what a group of scientists and students from Stanford University in California says.

A review of data on all of the world's known bird species (nearly 10,000!) has led to a worrisome conclusion. Between 500 and 1,300 bird species will vanish by the year 2100, the researchers predict. As many as 1,050 more will dwindle to such small populations that they'll basically lose their place in the web of life.

The birds that are most at risk include scavengers, fish eaters, fruit eaters, and nectar sippers. The scientists based their predictions on information about habitat, diet, and range, among other factors.

If birds such as the black-browed albatross disappear, their ecosystems could also suffer. Fish-eating seabirds fertilize remote islands with their droppings.
PhotoDisc

In the past 500 years, by comparison, only 129 bird species are known to have disappeared.

As the birds go, other parts of ecosystems might start falling apart, too. Some bird species, for instance, pollinate only certain types of plants. And these plants might not survive without them.

Vultures in Asia provide another example of what can happen when food webs lose their shape. In the past decade, lots of vultures have died after eating carcasses of livestock that had been given medicine. Such drugs keep the animals healthy, but they're poisonous to the birds (see A Vulture's Hidden Enemy).

As vulture numbers have declined, populations of their competitors have grown in size. This group includes wild dogs that spread disease.

Without help for the birds, then, the world might end up looking like a very different place. And we might suffer, too.—*E. Sohn*

1) What do you think will happen if the bird species continue to disappear? Be sure to explain your reasoning.

_____

_____

2) How do birds benefit other organisms in their ecosystem?

_____

_____

Name:_____ Class Period _____

Indicators 2.8

Short Video (15 min): The Science of Life: Ecology: Organisms in Their Environment

Directions: Below, write 5 facts from the movie.

(1) _____

_____

(2) _____

_____

(3) _____

_____

(4) _____

_____

(5) _____

_____

Closing

I'm sad to say that our Life science unit has come to a close, but that doesn't mean that you have to stop studying Life Science. Life is all around us, even in places that we can't see with the naked eye! Continue to observe life, asking questions and attempting to answer them through the scientific method. Most of all, keep it fun. Life science is fun!

Question 1 is from pages 5-6

1) The 5 characteristics of living things are (1) they are organized, (2) they reproduce, (3) they adjust to surroundings, (4) they grow and develop and (5) they need energy, water and minerals.

    a. All living things are organized. This means that they are _____ designed to perform different _____ functions.

    b. All organisms have the ability to reproduce. Organisms produce new organisms that are _____ to them.

    c. All organisms have the ability to adjust (change) to their _____.

    d. Most organisms grow. When they grow, they go through changes known as _____.

    e. All organisms need energy, water and minerals to function. If they do not get these, organisms _____.

Questions 2 & 3 are from page 7

2) Write the definition of the term "cell."_____

    _____

3) Write the definition of the term "organism."_____

    _____

Questions 4-7 are from page 8

4) The basic structural unit of life is the _____.

5) All living things are made up of _____.

6) The yolk of a chicken or ostrich egg is only _____ cell.

7) It is important to realize that it does not matter whether the organism consists of one cell, many cells, or billions of cells, the basic function required for _____ are _____ for all _____.

Question 8-9 are from page 10

8) Cells are sort of like _____.

9) Living things are made of _____, similar to the way that some things are made of building blocks.

Questions 10-15 are from page 12

10) The _____ is a rigid structure outside the cell membrane that supports and protects the cell (for plants, fungi and some protests and bateria)

11) The _____ is a structure that forms the outer boundary of the _____

12) Food, oxygen and _____ move into the cell through the _____.

13) Cells that perform photosynthesis (plants and some protists) take in _____ through the cell membrane instead of _____.

14) The largest organelle in the cytoplasm of a eukaryotic cell is usally the _____.

15) The _____ is like a manager who directs everyday business for a company and passes on information to new cells.

Questions 16-22 are from page 13

16) Within a cell, a _____ fills a similar role to a suitcase as a temporary storage space for the cell.

17) Vacuoles are large in _____ cells and small in _____ cells.

18) Just like a taxi transports people, _____ transport protein packages created by the _____.

19) Cells make their own proteins on small structures in the cytoplasm called _____**.**

20) Ribosomes are either free floating in the _____ of a cell or attached to _____ in a cell.

21) In cells, structures called _____ are stacks of membrane-covered sacs that package and move proteins to the outside of the cell. Golgi bodies are the packaging and secreting _____ of the cell.

22) Golgi Bodies are sometimes referred to as _____.

Questions 22-26 are from page 14

23) Cells require a continuous supply of energy. _____ are organelles where food molecules are broken down and energy is _____. The energy is then stored in other molecules that can power cell _____ easily.

24) An active cell constantly produces _____ products. In the cytoplasm, organelles called _____ contain chemicals (enzymes) that digest wastes and worn-out cell parts. These chemicals also _____ food.

25) The _____ is a folded membrane that moves materials around in the cell. The ER extends from the _____ to the _____ and takes up quite a bit of space in some cells.

26) _____ is the gel-like material inside the cell membrane and outside the nucleus.

Question 27-28 are from page 15

27) _____ contain a green pigment called chlorophyll. This is what makes plants green.

28) Write the definition of each of the following terms:

a. Cell Wall:_____

_____

b. Cell Membrane:_____

_____

c. Nucleus:_____

_____

d. Vacuole:_____

_____

e. Vesicles:_____

_____

f. Ribosomes:_____

_____

g. Golgi Bodies:_____

_____

h. Mitochondria:_____

_____

i. Lysosomes:_____

_____

j. Endoplasmic Reticulum:_____

_____

k. Cytoplasm:_____

_____

l. Chloroplasts:_____

_____

Questions 29-33 are from page 18

29) A _____ is the smallest unit that carries on all the activities of life.

30) _____ are the cell parts that contain chlorophyll, the green pigment that gives plants their color.

31) The smallest single-celled animal has the _____ needs and requirements to survive as the most complex animal that walks this earth.

32) Define Eukaryote Cells:_____

_____

33) Define Prokaryote Cells:_____

_____

Questions 34 and 25 are from page 22

34) Write the definition of each of the following terms:

a. Tissue:_____

_____

b. Organ:_____

_____

c. Organ System:_____

_____

35) The human body is made up of several _____ systems that work together as one unit.

Questions 36-39 are from page 23

36) What is heredity?_____

_____

37) Gregor Mendel (1822-1884), an _____ and _____, showed that patterns of heredity reflect the transmission of coded information from parents to _____.

38) Sometimes genes are damaged or copied incorrectly. These changes are called _____.

39) The body of an adult human has around _____ red blood cells alone and produces millions of new ones every _____ as old cells wear out and die.

Question 40 is from page 25

40) Gregor Mendel's contribution to the field of _____ evolved from his study of _____. He noticed that the pea plants varied in height. Some had yellow seeds, some green. The seven traits he studied were _____, _____, _____, _____, _____, _____, and _____.

Question 41 and 42 are from pages 28 and 29.

41) Building a person is no sleight-of-hand magic trick. Building a person involves following a set of instructions. Your body stores those instructions in a long, twisted molecule, _____. It controls everything about the way you _____, from the color of your eyes to how tall you are to the width of your _____. You carry _____ of copies of those DNA instructions.

42) Tiny building blocks called _____make up your skin, and every other part of you. _____ of cells surround every hair growing out of your skin.

Questions 43-45 are from page 30

43) If you made a little hole in the nucleus sack, you would see _____ peeking through. If you took away the outside of the nucleus, the DNA would spill out like _____. Stretched out, the DNA from one cell would be as long as the height of a _____ man.

44) Sometimes cells use a kind of fork to wind up their DNA spaghetti into structures called _____.

45) If you unraveled all your chromosomes from all of your cells and laid out the DNA end to end, the strands would stretch from the Earth to the Moon about _____ times.

Questions 46-49 are from page 31

46) In the 1950s, _____ got a look at an X-ray image, taken from DNA crystals. From the pattern of spots on the image, he concluded that DNA must be a spiral, or _____ shape.

47) _____ (1920-1957) produced the first usable X-ray pictures of _____ ever taken. Watson used her pictures to determine that DNA spirals into a _____. She was not included in the publication that reported the structure of DNA and she died before the _____ Prize was given to Watson and Crick. Scientists still debate whether she would have shared the prize with them had she lived.

48) If you could pull apart the double helix, you would see the exposed ends of four different _____ waving in the air. Those four chemicals, called _____ carry the information used to make a body and to keep it running.

49) Scientists named each of the four bases with a letter, G, A, T or C. All of the letters in one cell make up the human _____, a complete set of _____ for making a person.

Questions 50-53 are from page 47

50) There are two primary influences acting together throughout one's life— _____ and _____.

51) Heredity is the passing on of _____from one _____ to the next. Environment includes all of the other forces that act on an _____.

52) A _____ is a group of organisms that resemble one another and are potentially able to _____ with each other.

53) _____ traits cause members of a given species to be different from each other.

Questions 54-56 are from page 48

54) People have many _____ traits. Some can be seen, some can't. Some traits are classified as _____, some as _____. For example, freckles and dimples are causes by _____ genes. Attached earlobes are _____ traits. Even if both parents have detached earlobes, it is still possible for the offspring to have the recessive trait because each parent could be carrying the _____ gene.

55) What is a "Widow's Peak?"_____

_____

56) What is a cleft chin?_____

_____

Questions 57-59 are from page 52

57) The DNA pattern is the same for each _____ in the body. Therefore, a person's DNA pattern can be determined from a strand of hair, a drop of blood, or any _____ of the body. DNA "fingerprints" have become popular recently in solving violent _____.

58) In a _____ relationship, two species live together in a way that is usually _____ to one, sometimes to both.

59) Ferocious sharks let tiny fish called _____ survive by cleaning food from the sharks' sharp teeth.

Questions 60-63 are from page 53

60) Just as organisms inherit genes for physical characteristics such as fur or petal color, they also inherit genes for certain _____. The simplest behaviors are _____: you inherited genes for a set of reflexes that cause you to blink your eyes in bright light, snatch your hand away from hot objects, or when you inhale smoke.

61) Animals also inherit genes for behavior patterns more complex than reflexes. These behaviors are known as _____. Almost all animals inherit the instinct to stay _____. This instinct for self-preservation causes animals to seek food, water, and shelter and to defend themselves against enemies or to run form _____. Rabbits instinctually run when they see danger.

62) Animals also inherit instincts to reproduce and to rear and _____ their young. Other examples of instinctive behavior include _____ and _____. Squirrels and chipmunks hibernate in winter. Birds migrate in winter by _____.

63) An instinctive behavior is _____: you're born with it. In contrast, a learned behavior is developed from _____. Although humans and some animals do inherit an instinct to learn, the content of their learning is determined by their _____.

Question 64-66 are from page 54

64) To learn from experience, an organism must have a _____ to store information to be used later. Memory helps an organism learn through _____ and _____. In trial-and-error learning, an organism tries to do a task again and again, sometimes making _____, but other times _____. Eventually the organism figure out what it did to succeed. A mouse will learn how to get through a maze to find food at the end by trying different _____ again and again. The mouse eventually _____ which routes don't lead to food and which do.

65) Animals learn not only by trial and error, but also learn by _____, which involves a system of _____ or _____. If you have a dog, you and your parents probably trained it in this way.

66) A Russian scientist named _____ once conducted a famous experiment in conditioning. _____ rang a bell very time he offered _____ to a group of dogs. The dogs would begin to _____ when they were fed. After repeating this action many times, Pavlov continued to ring the bell, but without feeding the dogs. He discovered that the dogs still began to salivate every time he rang the bell.

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(pp.69-71)

Cards for Quiz 1

What are the 5 Characteristics of Living Things?	All living things are organized. What does this mean?
All organisms have the ability to reproduce. What does this mean?	What happens if an organism does not get energy, water or minerals?
What type of instrument would you need to see a cell on your own body?	Define “cell”
Define “organism”	What is a multicellular organism?
All living things begin as how many cells?	**What type of instrument do you need to see a cell on your own body?**

Cards for Quiz 1 (Continued)

What is DNA?	A cell divides into two separate cells using a process called what?
Explain how a cell divides into two separate cells.	All living things are made of what?

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(p.73-75)

Cards for Quiz 2

Cell Wall	Cell Membrane
Nucleus	Vacuole
Vesicles	Ribosomes
Golgi Bodies	Mitochondria
Lysosomes	Endoplasmic Reticulum
Cytoplasm	Chloroplasts

Cards for Quiz 2 (continued)

What are 3 ways that plant cells differ from animal cells?	What are 3 ways that plant cells are the same as animal cells?
Define “Prokaryote Cells”	Define “Eukaryote Cells”
Define “Tissue”	Define “Organ”
Define: “Organ System”	

___/ 20
(p.77-79)

Cards for Quiz 3

Define “Heredity”	What did Gregor Mendel show?
How many chromosomes do humans have?	What is it called when an egg joins a sperm?
Who was the Austrian monk to discover the rules of heredity while working with pea plants?	What is a dominant trait?
What do you call an organism that possesses two dominant or two recessive genes for a single trait?	**What do you call an organism that possesses one dominant and one recessive gene for a single trait?**
What do you call the diagram that assists you in predicting the traits of offspring?	**What are chromosomes made of?**

Cards for Quiz 3 (Continued)

What woman, along with Francis Crick, James Watson and Maurice Wilkins is credited with helping to discover the structure of DNA?	Define "DNA"
Who is Rosalind Franklin and what did she do?	What is the human "genome?"
Is it possible right now to produce a photograph of someone by only viewing their DNA?	**What are the two primary influences acting together throughout one's life?**
What are 3 environmental influences on one's life?	What is a species?
Traits that cause members of a given species to be different from each other are called what?	**Name 3 inherited traits and 3 non-inherited traits**