Colegio Karl C. Parrish

A Tradition of Excellence

Life Science

Curricular Standards and Pacing Guide
Grade 6

Adopted from California State Standards (2012)

http://www.cde.ca.gov/be/st/ss/

Prepared by A. Morgan, Curriculum Coordinator

Reference #	Pacing Guide	Standard or Sub-standard (descriptor)	Essential Questions	Resources and Assessment
		Science Skills		
Science 6.9.1 Science 6.10.3 Science 6.10.5	**1st Quarter** Week 1, 2	Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence. Communicate the steps and results from an investigation in written reports and oral presentations.	*What is the appropriate language used to explain scientific phenomena and why is that important?* *What tools and resources can be used to assist in scientific investigations?*	Beginning of year survey Science Process Skills Activity Moodle Scavenger Hunt
		Classification		
Science 6.3.4 Science 6.3.5	Week 3, 4, 5, 6	Students know how to construct a simple branching diagram to classify living groups of organisms by shared derived characteristics and how	*How does grouping organisms allow us to make sense of the natural world?*	Chapter 1 in Foresman Textbook Chapter 1 Test from Assessment Book Scott

		to expand the diagram to include fossil organisms. Students know that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.	*How and why did organisms become the way the are today, and why do organisms exhibit their specific traits?*	Foresman Science Textbook CCC! movie titled "Classifying Living Things"
		Cellular Biology		
Science 6.1.1 Science 6.1.2 Science 6.1.3 Science 6.1.4 Science 6.1.5 Science 6.1.6	Week 7, 8, 9, 10	Students know cells function similarly in all living organisms. Students know the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls. Students know the nucleus is the repository for genetic information in plant and animal cells. Students know that mitochondria liberate energy for the work that cells do and that chloroplasts capture sunlight energy for photosynthesis. Students know cells divide to increase their numbers through a process of mitosis, which	*What makes something be considered as "living"?* *What behind the scenes functions allow living organisms to survive?*	Chapter 2 in Foresman Textbook Cell Model or Metaphor Poster Project Ch.2 Study Guide-Use chapter 2 test from Scott Forseman Assessment Book Diffusion Gummy Bear Lab Cells Unit 2 Crossword WISE Project Project Title: "Mitosis and Cell Processes" Wise Instructions for Students (Usernames and

		results in two daughter cells with identical sets of chromosomes. Students know that as multicellular organisms develop, their cells differentiate.		passwords will be different for every teacher and class) Cell Theory Rap
		Reproduction		
Science 6.2.1 Science 6.2.2 Science 6.5.4 Science 6.5.5 Science 6.5.6	**2nd Quarter** Week 11 and 12, 13, 14	Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms. Students know sexual reproduction produces offspring that inherit half their genes from each parent. Students know how the reproductive organs of the human female and male generate eggs and sperm and how sexual activity may lead to fertilization and pregnancy. Students know the function of the umbilicus and placenta during pregnancy. Students know the structures and processes by which flowering plants generate	*How do organisms and species in the natural world interact with each other and the environment in order to survive?* *How are new organisms created?* *Where do we get our characteristics and traits*?	Chapter 3 in Foresman Textbook Chapter 3 Test from Foresman Science Assessment Book (Reproduction and Genetics Unit have combined assessments)

		pollen, ovules, seeds, and fruit.		
		Genetics		
Science 6.2.1 Science 6.2.2 Science 6.2.3 Science 6.2.4 Science 6.2.5	Week 15 and 16, 17	Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms. Students know sexual reproduction produces offspring that inherit half their genes from each parent. Students know an inherited trait can be determined by one or more genes. Students know plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive. Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the	*How are new organisms created?* *Where do we get our characteristics and traits?* *What role do genes play in the development of physical features, diseases, mutations, and personalities?*	"How can a coin toss model heredity?"-Activity Chapter 3 Unit Test from Foresman Assessment Book Genetic Code Article and worksheet Mutation Project DNA Replication activity Genetic Current Event Articles and Questions

		chromosomes of each cell.		
		Scientific Method Investigation		
Science 6.10.1 Science 6.10.2 Science 6.10.3 Science 6.10.4 Science 6.10.5	Weeks 18 and 19	Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure). Communicate the steps and results from an investigation in	*How can we use scientific inquiry to solve problems in the world and to make new discoveries?* *How can questioning lead to learning, and what is the importance of questioning in the investigation of natural phenomenon?* *What is the appropriate language used to explain scientific phenomena and why is that important?* *What tools and resources can be used to assist in scientific investigations?*	Science Investigation Guidelines Research Tips Annotated Bib. Example Investigation Write Up Video to Inspire Scientific Method: *October Sky*. Can be rented from Netflix or downloaded from Cuevana or other websites. (Video Guide Questions) Observation Assignment (Outdoor Activity)

		written reports and oral presentations.		
		Body Systems		
Science 6.9.1 Science 6.5.1 Science 6.5.2 Science 6.5.3 Science 6.6.1 Science 6.6.2 Science 6.6.3	**3rd Quarter** Weeks 20, 21, 22, 23	Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide. Students know how plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism. Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system. Students know how bones and muscles work together to provide a structural framework for movement. Students know how to compare joints in the body (wrist,	*How can we stay healthy and ensure the success of our many body systems?* *How do our body systems work and how do they contribute to our overall life functions?* *What is necessary for our bodies to move and function properly?*	Diet Analysis Activity Chapter 4 in Scott Foresman Science Textbook Chapter 4 Unit Test from Foresman Assessment Book Body System Jigsaw *Life* Movie Guide-Mammals (BBC series *Life* can be purchased online).

		shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints). Students know how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system. Students know that contractions of the heart generate blood pressure and that heart valves prevent back flow of blood in the circulatory system.		
		Plants		
Science 6.5.1 Science 6.7.1 Science 6.7.2 Science 6.8.1 Science 6.8.2 Science 6.8.3	Weeks 24, 25, 26	Students know how plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism. Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through	*How do environment and living organism work together to maintain life?* *What are the compositions of living things, and how do these compositions allow them to function properly?*	Chapter 5 in Scott Foresman Science Textbook Chapter 5 Unit Test from Foresman Assessment Book Life Movie Guide- Plants (BBC series *Life* can be purchased online). Chapter 5

		food webs. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. Students know that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms. Students know that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur. Students know that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.		"Plants" Guided Notes Plant Parts and Function Project

		Biomes		
Science 6.7.4	Weeks 27, 28, 29, 30	Students know different kinds of organisms may play similar ecological roles in similar biomes.	*What are proper environments in which living species can survive?* *How do living species vary from environment to environment?*	Chapter 6 in Scott Foresman Science Textbook Chapter 6 Unit Test from Foresman Assessment Book All Planet Earth (BBC series) study guides, discussion guides and movie questions are located on my moodle website. *Under the "Planet Earth" heading. Planet Earth TV series can be obtained online, boughten, or rented from Netlflix. Review Crossword Puzzles for Binationals Week
		Evolution		
Science 6.3.1 Science 6.3.2 Science 6.3.3 Science	**4th Quarter** Week 31, 32	Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms. Students know the reasoning used by Charles Darwin in	*How and why did organisms become the way they are today?* *Why do organisms exhibit their specific traits?*	Selections from Darwin's *Origin of Species* Can be obtained from KCP Library

6.5.7		reaching his conclusion that natural selection is the mechanism of evolution. Students know how independent lines of evidence from geology, fossils and comparative anatomy provide the bases for the theory of evolution. Students know how to relate the structures of the eye and ear to their functions.		
		Ecology		
Science 6.7.1 Science 6.7.2 Science 6.7.3 Science 6.7.5	Week 33, 34	Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. Students know populations of organisms can be categorized by the functions they serve in	*How does the environment affect us and other living organisms?* *How can we affect the environment in which we and other organisms live?*	Chapter 7 in Scott Foresman Science Textbook Chapter 7 Unit Test from Foresman Assessment Book Food Web Group Poster

		an ecosystem. Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.		
		Science Fair		
Science 6.10.1 Science 6.10.2 Science 6.10.3 Science 6.10.4 Science 6.10.5	Week 35, 36, 37, 38	Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the	*How can we use scientific inquiry to solve problems in the world and to make new discoveries?* *How can questioning lead to learning, and what is the importance of questioning in the investigation of natural phenomenon?* *What is the appropriate language used to explain scientific phenomena and why is that important?* *What tools and resources can be used to assist in scientific investigations?*	Initial Project Description/Research Stage Science Fair Project Proposal Science Fair Webquest http://www.authorstream.com/Presentation/davgen-435655-testable-questions/ (Testable Question and Variable Powerpoint)

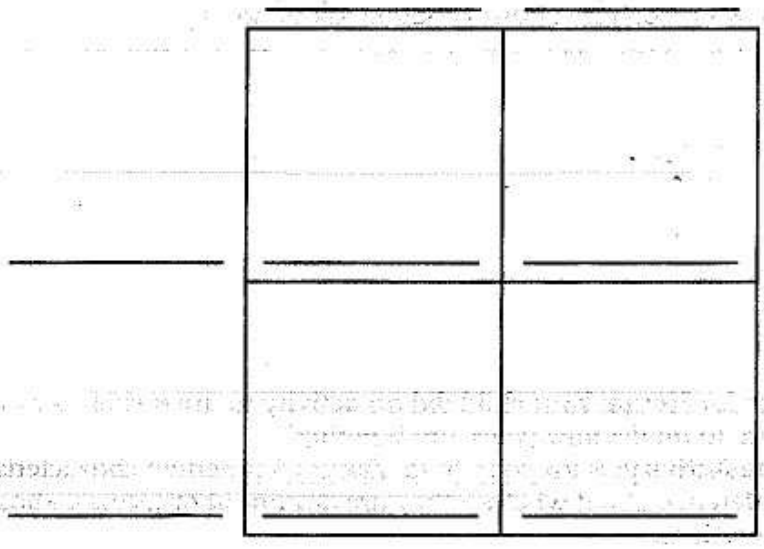
		scientific evidence. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure). Communicate the steps and results from an investigation in written reports and oral presentations.		Initial Inquiry, Purpose, and testable question/variable worksheet Research Stage Assignment and Example First write-up assignment Science Fair Description and Rubric Final Write-up Example

Investigate: How can a coin toss model heredity?

❸–❺ Shake the 2 coins, and then toss them gently onto your work surface. Record the letters showing on the coins. Repeat until you have 16 trials.

Coin Toss	Inherited Genes	Offspring Appearance
1	Tt	tall
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

❻ Draw a Punnett Square, showing all the possible different offspring of the parents used for steps 3–5.



Explain Your Results

1. Interpret Data: Which combination appeared most often—TT, tt, or Tt?

_____

_____

_____

2. Which combinations produce tall offspring? Explain

_____

Go Further

How can you model the inherited traits of offspring whose parents have the genes **TT** and **Tt**? Make a plan to investigate.

_____

_____

_____

Self-Assessment Checklist	
I **made a model** to show how the genes for height are inherited in a pea plant.	_____
I tossed the coins and recorded my data in the chart.	_____
I drew a Punnett Square to represent my data.	_____
I **interpreted** my **data** to determine which combination appeared most often.	_____
I explained which combinations produce tall offspring.	_____

Notes for Home: Your child did an activity to use a coin toss and a Punnett Square to model how genes are inherited.
Home Activity: With your child, discuss 5 inherited characteristics and make an inference about whether they are dominant or recessive based on your observations.

Cell Model or Metaphor Poster

You may choose to create **either a model or a metaphor poster** representing the cell. You may **choose plant, or an animal cell**, but make sure you tell me which you chose!

Metaphor Poster:

A metaphor is a comparison of one thing to another. A good metaphor helps us understand the two things more clearly. (For example, the atom is sometimes compared to a miniature solar system; the solar system is a metaphor for the atom. Each part of the atom matches up with a part of the solar system.) Your job is to think of good metaphors that help us understand the organelles in a cell and their functions, and then use those metaphors to explain what a cell is and how it works. You should present your metaphors on a poster. It should include:

- ☐ Descriptive Title, Heading
- ☐ Brief overview or introduction to your metaphorical cell. Don't forget to say whether it is a plant or animal cell.
- ☐ Include a diagram or picture for each organelle.
- ☐ Include a metaphor for each organelle next to each picture on your poster.
- ☐ Under each metaphor, explain why you chose the metaphor to represent your organelle.
- ☐ More detailed explanation of each part of the cell and how it fits into the metaphor. YOU NEED TO SHOW YOUR UNDERSTANDING OF THEIR FUNCTIONS. Include all parts of the cell listed at the bottom of this page!

Model:

A model is a way of representing something too big or too small to be seen. A model helps us understand what we cannot otherwise see. You may design a three-dimensional model out of materials of your choice to help us understand the cell. Include:

- ☐ All parts of the cell. Choose materials that help us understand the function of each organelle. They can be metaphorical. (For example, you can have a toy brain represent your nucleus.) You could also mold different candies to look like organelles.
- ☐ Labels or a written explanation that can be displayed with your model. Explain whether your model is of a plant or animal cell, and explain which part of your model represents each organelle in the cell.
- ☐ You must include a heading for each organelle, an explanation of its function, and how your model organelle represents the real thing. This can be typed on normal computer paper.
- ☐ Please bring in your model in a way that it can be displayed easily and protected from damage! Include all parts of the cell listed at the bottom of this page.

These are the organelles you must include regardless of whether you create a model or a poster:

If you chose a plant cell: Cell Wall, Chloroplasts, Vacuole, Cell Membrane, Golgi Apparatus, Nucleus, Endoplasmic Reticulum, Mitochondrion, Ribosomes.

If you chose an animal cell: Nucleus, Cytoplasm, Golgi Apparatus, Lysosome, Cell Membrane, Mitochondrion, Vacuole, Endoplasmic Reticulum, Ribosomes.

Rubric

(If you work in partners, I expect twice as much work, and I will be grading tougher. Maximum groups of 2)

This counts as a project grade, so please put plenty of work into it!

If you want this grade:	**Your cell metaphor poster or model should be like this:**
35	o You included everything listed on the assignment sheet. o Your work is very neat and attractive, and all writing is typed or in pen. o You included all organelles and explained how they fit into your metaphor poster or model. o Your metaphor poster or model is creative and ORIGINAL! o You have only 1-2 tiny spelling or grammar mistakes - or none! o You have brought it ready to display in class.
30	o You included everything listed on the assignment sheet. o Your work is neat and attractive, and all writing is typed or in pen. o You included all organelles and explained how they fit into your metaphor poster or model, but your explanation is not always clear. Or you forgot one organelle. o Your metaphor or model is creative and ORIGINAL! o You have only a few spelling or grammar mistakes. o You have brought it ready to display in class.
25	o You leave out one thing listed on the assignment sheet. o Your work is a little messy, or is written in pencil. o You included most of the organelles and tried to describe how they fit into your metaphor poster or model. o You have only a few spelling or grammar mistakes. o You have brought it ready to display in class.
15	o You leave out more than one thing listed on the assignment sheet. o Your work is very messy! o You forgot many organelles, or you did not label or explain how the organelles fit into your model or metaphor. o You make many spelling & grammar mistakes.

	o You have brought it ready to display in class.
0	You do not turn in a metaphor poster or model, or it is completely unacceptable.

Process Skills Activity

Teacher: Cut out each definition and each term from pages xxii-xxv in the Foresman science textbook. Students work in groups to see how fast they can match the terms up with the definitions. The first place team recieves a positive participation point.

Think of a statement that you can test to solve a problem or answer a question about a python or other organism in a tropical rainforest.

Scientists _____ from their observations in rain forests. They put the _____ into charts or tables.

Scientists use the information they have collected to solve problems or answer questions.

As scientists explore a rain forest, they _____ and _____ to test a hypotheses.

As scientists perform an experiment, they _____ and _____- the _____ so that they test only one thing at a time.

Scientists use words, pictures, charts, and graphs to share information about their investigation.

A scientist exploring a rain forest _____ many things. You use your senses too to find out about other objects, events, or living things.

Scientists _____ living and nonliving things in a rain forest according to their properties. When you _____, you arrange or sort objects, events, or living things.

Scientists might _____ the size of an organism in a rain forest. When they _____, they tell what they think an objects size, mass, or temperature will _____. Then they measure these factors in units.

During an investigation, scientists _____ what they think is happening, based on what they already know.

Before they go into a rain forest, scientists tell what they think they will find.

Scientists might _____and _____ models, such as maps, to help plan where to go during an investigation.

Beginning of the Year Survey

6th Grade Science

Please write your answers in complete sentences.

Full Name_____ What name do you like to be called?_____

Date_____

Birthday_____

Who are your family members?_____

_____

_____

When I grow up_____

My closest friends are_____

My favorite things to do are_____

A goal I have is_____

Here are my favorites:

Sports_____

Books_____

Music_____

Magazines_____

Hobbies_____

Movies_____

Clothes_____

Games_____

One thing people don't know about me is_____

_____

A sklll I have is_____

A person I admire is_____because_____

_____

Something I would like to do better is_____

I like it when a teacher_____

My previous teachers would tell you this about me:_____

_____

_____

I am proud of myself when I_____

_____

In school, I like to_____

_____

In school, I DON'T like to_____

_____

Describe 4 characteristics of a good teacher (In your opinion).

1.

2.

3.

4.

Laboratory: Diffusion of Water with Gummy Bears

Names of Group Members_____
_____

Purpose: To investigate the movement of water into and out of a polymer. Gummy Bears are made of gelatin and sugar. Gelatin is a polymer that forms large three-dimensional matrices which give structural support to jellies and jams, and lots of other things that you use every day.

Hypotheses:

1. If someone places Gummy Bears in tap water, then the size of the bears will (increase, decrease, remain the same). Circle your answer.
2. If someone places Gummy Bears in distilled water, then the size of the bears will (increase, decrease, remain the same). Circle your answer.

Materials: for pairs of students

- 2 - plastic cups (8oz)
- permanent marker
- 2 - aluminum or plastic screens (4"x4")
- 2 - Gummy Bears (different colors)
- distilled water
- saturated salt solution (6 oz per cup)
- tap water
- 2 - centimeter rulers

Procedure

1. Obtain two plastic cups, two different colored Gummy Bears and two rulers.
2. On the side of each cup, write your name and class period using a permanent marker.
3. Label one cup "TAP WATER" and the other "DISTILLED WATER".
4. Measure your bear (in cm) from top to bottom (length) and from side to side (width) and from front to back (height). Record the centimeters in the data table. Use decimals.
5. Place the bears in the cups and cover one with distilled and one with tap water.
6. Place the cups on the counter away from direct sunlight. Let them sit overnight.
7. On the next lab day, gently pour the water over a screen into a sink. Catch each bear on a separate screen.
8. While on the screen, measure the length, width, and height. Record. Blot the screen dry by placing it on a paper towel. BE CAREFUL not to break the bears, they are very fragile.
9. Place the bears back into their correct cups. Cover the bears with saturated salt solution. Let them sit overnight.
10. Find the dimensions of the bears and record. Calculate the volumes (l x w x h).

Data Table for Dimensions in centimeters: (Use decimal numbers.)

Gummy Bear in Tap Water

	Length	Width	Height	Volume
Before Water				
After Water				
After Salt Water				

Gummy Bear in Distilled Water
The bears on the right show sizes of dry and wet bears.


The before and after water bears.

	Length	Width	Height	Volume
Before Water				
After Water				
After Salt Water				

Conclusions:

1. What happened to the bears when placed in distilled water? Why?

2. What happened to the bears when placed in tap water? Why?

3. What happened to the bears when placed in salt water? Why?

4. What do you think would have happened to the bears if, after the last day, they were again placed in distilled water?

5. Calculate the percent change in volume after each step of the experiment.
   % change in volume = (final volume - initial volume)/ initial volume x 100

6. Place the percentages in the table below:

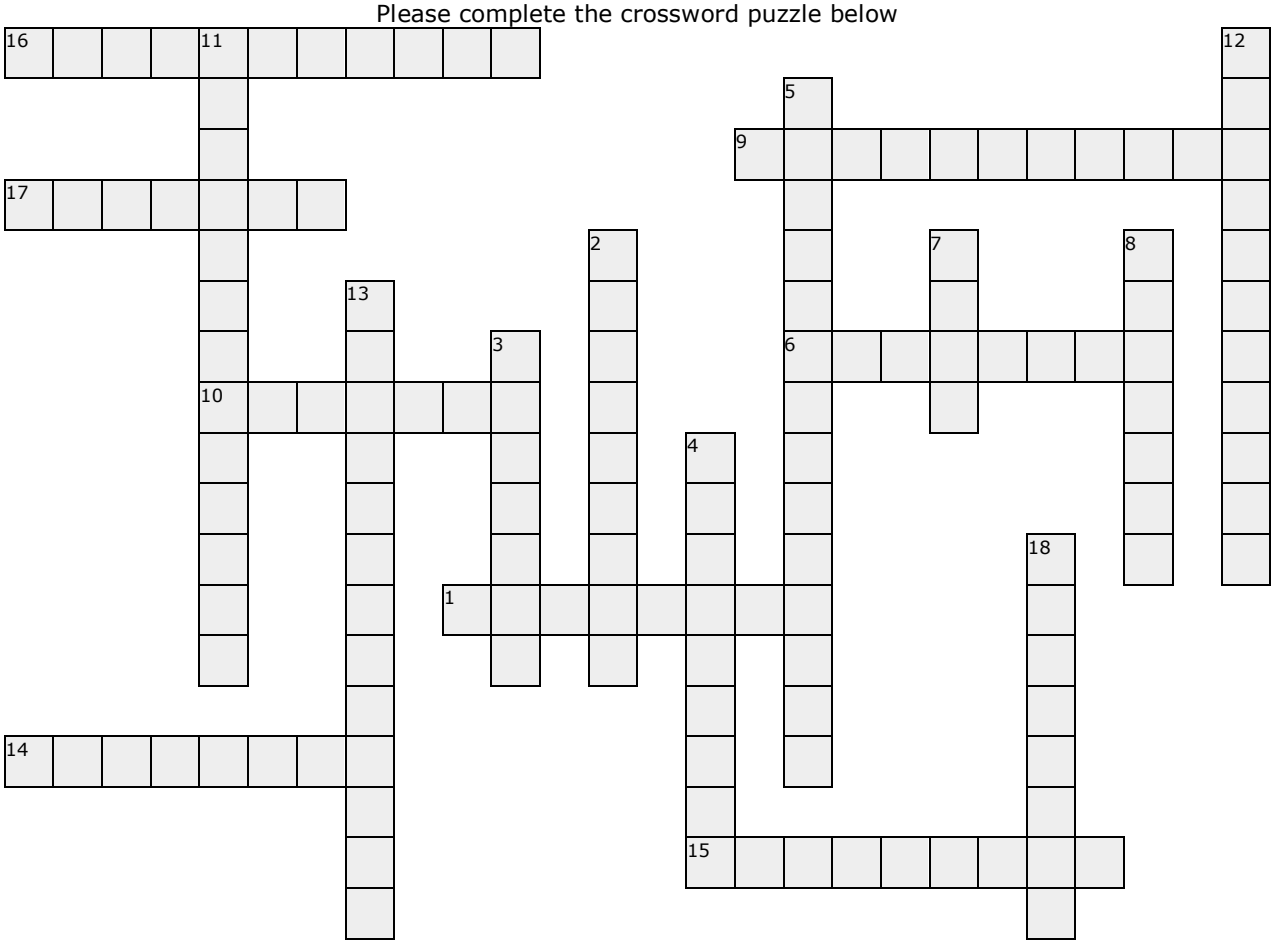
Bears	% Change in Water	% Change in Salt Water
Tap Water Bear		
Distilled Water Bear		

7. Make a bar graph of the percent changes. Label axes. Place a scale on the vertical axis for percent change and give a title for the graph. Place the data for both bears on the same graph. USE GRAPH PAPER. If you have a negative value for a percent change, start the vertical axis at a negative number. (For example: -50, -25, 0, 25, 50, 75, 100, etc.) An example of the horizontal axis is below:

8. Write a paragraph which explains the results of this experiment using the concepts of diffusion and swelling. Think about how fast changes like these take place (kinetics and rates of diffusion) and how much swelling can occur (equilibrium and limiting swelling volume). Include your data where appropriate to explain your results and conclusions.

Cells-*Unit 2 Crossword*

Please complete the crossword puzzle below



Across:

1. This organelle starts the process of building proteins.
6. Plants absorb what through their leaves that is necessary for photosynthesis.
9. During photosynthesis, this substance is responsible for creating food for the plant.
10. This organelle contains chromosomes which are tightly-coiled DNA strands.
14. This compares two things without using like or as.
15. The phase of mitosis where chromosomes line up in the middle of the Nucleus.
16. Rod-shaped structures made up of tightly-coiled DNA.
17. When filled with water, this organelle makes the plant rigid.

Down:

2. This is the process that explains why gummy bears get bigger when left in water overnight.
3. The diffusion of water across the cell membrane.
4. This organelle is the soup of the cell.
5. This process allows plants to make their own food.
7. Obtaining nutrients and energy is on job of the _____.
8. The process where the nucleus divides.
11. This organelle converts the chemical energy of food into a form the cell can use.
12. Photosynthesis takes place in this organelle.
13. This organelle allows food to enter the cell and wastes to exit.
18. The phase of mitosis where sister chromosomes move to opposite parts of the cell.

Cell Theory Rap

Listen close to the story I tell.
It's the rapping story of the living cell.
It's a happy tune that's sort of cheery.
About a real tough topic called the cell theory.
All animals, plants, and protists too,
Are made of cells with different jobs to do.
They're the basic units of all organisms,
And I hope by now you got the rhythm.
It all started with one dude named Hooke.
Who at some cork cells took a look.
He used a scope and took his time.
'Cause a cell is small and thinner than a dime.
Say 1, 2, 3, 4,
Are you ready to learn some more?
The animal cell has many parts,
And you must know each one by heart.
Like the farmer man in the dell.
The nucleus controls the cell.
its gives the orders -- kind of like a brain.
And it's protected by a nuclear membrane.
Around the cell, you'll find another "skin,"
The cellular membrane holds the whole cell in
But its job isn't simple there's no doubt,
It lets some particles go in and out.
Now please don't lose your science enthusiasm,
Listen to the story of the cytoplasm.
All around the cell this thick fluid does go,
But in the nucleus it will not flow.
And don't forget those ribosomes -
This is where proteins come from.
These protein factories are so small, you'll agree,
You need an electron microscope to see.
Just when you thought you weren't having any fun,
Along comes the endoplasmic reticulum.
These tube-like structures serve as a track,
To carry stuff to the membrane and back.
Now have you ever seen any doughnuts without holes?
In a cell, they're called vacuoles.
They're filled with stuff like H2O
And they carry food so the cell can grow.
Las of all, but not the very least,
Mitochondria - mighty cellular beasts,
Since they turn sugars into energy so well,
We call them the powerhouse of the cell.
Now my friend, you know it well,
The unforgettable story of the living cell.
"Science World"
10-5-90

Will we all be tweaking our own genetic code? (Retrieved from BBC.com)

By Karen Weintraub Cambridge, Massachusetts

Professor George Church explains his vision for the future of genetics

You have to wonder what's going on in the DNA of Harvard genetics professor George Church.

What extra bit of code does he have that the rest of us don't? If genes tell the story of a person's life, then some altered sequence of 'A's, 'C's, 'G's and 'T's must be at play, because his brain works like almost no one else's.

About 30 years ago, Prof Church was one of a handful of people who dreamed up the idea of sequencing the entire human genome - every letter in the code that separates us from fruit flies as well as our parents. His lab was the first to come up with a machine to break that code, and he's been working to improve it ever since.

Once the first genome was sequenced, he pushed the idea that it wasn't enough to have one sequence, we needed everyone's. When people pointed to the nearly $3bn price tag for that first one, he built another machine.

Now, the cost is down to below $5,000 per genome, and Prof Church says we're quickly heading toward another 10- or 20-fold decrease in price - to roughly the cost of a blood test.

Genes: read, write, edit

To Prof Church, routine whole-genome sequencing will herald the beginning of a new era as transformative and full of possibilities as the Internet Age. But this is not just about insurance companies wanting to have every customer's entire genome in their files.

For Prof Church sees this only as a beginning of the project, rather than the culmination of three decades of work.

 Helping to develop the machines to sequence the human genome was Prof Church's first big achievement

He's pointing to at a bigger goal: Now that reading DNA code is almost simple, he wants to write and edit it, too.

He envisions a day when a device implanted in your body will be able to identify the first mutations of a potential tumour, or the genes of an invading bacteria. You'll be able to pop an antibiotic targeted at the invader, or a cancer pill aimed at those few renegade cells.

Another device will monitor your outside environment, warning you away from sites that pose a health risk.

A range of genetic disorders will be identified at birth, or even conception, and tiny, preprogrammed viruses will be sent into the body to penetrate compromised cells and correct the damage. Changing the adult body at the first signs of illness will be just as easy, he predicts.

There's no reason, Prof Church says, why people won't be able to live to be 120, and then 150.

Personalised Genomics

- There are 2,200 genes (out of 20,000) that are predictable and actionable, that is, doctors have a sense of what will happen to you if you are missing any of these genes.
- Women who have a mutation of the BRCA genes associated with breast cancer, for instance, are often counselled to get their breasts and ovaries removed to avoid the risk of cancer.
- People with a gene variation associated with Alzheimer's can do little more than worry.
- Sequencing your entire genome - learning the pattern of DNA in every gene in each of your cells - now costs about the same amount as determining whether you have any particular single gene. That means if it makes sense to sequence one of the 2,200 genes doctors know something about, it probably makes sense to go ahead and sequence your entire genome.
- During the outbreak of E. Coli in Germany this year, it took researchers less than two days to sequence the entire genome of a strain of E. Coli that had never been identified before

"There used to be this attitude: here's your genetic destiny, get used to it," Prof Church says. "Now the attitude is: genetics is really about the environmental changes you can make to change your destiny."

Democratic science

Standing at 1.93m, with a bushy reddish-grey beard, George Church is hard not to notice. The 57-year-old is both imposing and unassuming. There's an awkwardness to Church, like an 8th grade boy after a summer growth spurt, and an openness that makes him easy to like. His manner is the same with a Harvard faculty colleague as with the technician operating a machine he helped design.

This democratic instinct comes through in his science. Church advises 20 of the 30-or-so advanced genomics companies in the United States, but his heart is clearly in academia, doing basic science that helps everyone.

As he pushes for the mapping of more and more complete genomes, he also pushes to make those genomes public, so researchers can learn about medical conditions by comparing them. He's put 11 up on the web already, including his own, and is aiming for 100,000 more.

Once thousands of people with diverse backgrounds have made their genomes and health status public, researchers will be able to delve into a wide range of diseases and disorders, from schizophrenia to heart disease, diabetes to learning disabilities, looking for patterns.

"You bring down the price and many blossoms bloom," he says.

Prof Church doesn't want to make these discoveries himself. The pace of that kind of science is too slow for him, and not driven by technology.


Prof George Church at the Wyss Institute for Biologically Inspired Engineering at Harvard

'Evolution on steroids'

There's a climate-controlled room in the middle of Church's generous lab space, where a small tray shakes back and forth, jostling pellets of E. coli DNA.

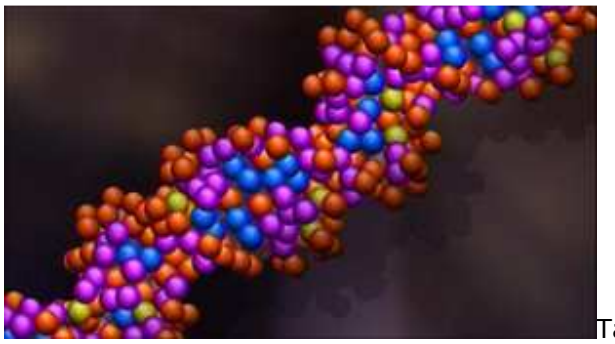
In a four-hour production process, researchers can turn on or off a single base pair of that DNA, or whole regions of genes to see what happens. The goal is to find a way to improve production of industrial chemicals or medications, or to test viral resistance.

"You could think of this as driving evolution to very rapid rates," Church said. "Sort of evolution on steroids."

The machine is a second-generation Multiplex Automated Genome Engineering (MAGE) machine, built with help from industry; the first one, which sits across the street not far from Church's corner office was a doctoral student's PhD thesis. Another thesis project sits just on the other side of the wall from new MAGE. Called the Polonator, this open-source genome-sequencing machine can read and write a billion base pairs at a time.

These two machines put Church's lab at the forefront of synthetic biology, a burgeoning new field that aims to make things Mother Nature never thought of, like high efficiency, non-polluting fuels, and viruses that can carry cancer drugs safely to a tumour.

With these machines, Prof Church is doing to synthetic biology what he's already done to personalised genomics: making it cheaper, faster and available to everyone.

 Take a snip of DNA here, insert a snip of DNA there

Ethical concerns

"He's beginning to transform synthetic biology to a larger scale," says James J. Collins, a professor at Boston University and Prof Church's colleague at the Wyss Institute for Biologically Inspired Engineering at Harvard.

Prof Collins acknowledges that some people will have ethical concerns about scientists writing genetic codes. But, he said, the reality of synthetic biology is nowhere near as scary as the hype. No one is creating doomsday species or humanoids. They're just barely able to create a single new cell, says Prof Collins.

"I think we as a community have a need and a role and responsibility to educate the public as well as to take precautionary safeguards to make sure we're not introducing something that's problematic," says James Collins, who builds his cells with programmable kill switches, so they self-destruct before reproducing or mutating.

George Annas, chairman of the department of health law, bioethics and human rights at Boston University, agrees that it's too early to be troubled by the ethics of synthetic biology. "At this point, we don't know how synthetic biology will turn out or even if it will work at all," he says.

Of the possible fears about new life forms: "I think we're in the realm of science fiction right now," Mr Annas says.

Reality check

Prof Church's optimism about the power of reading and writing DNA is contagious, but not irresistible.

"You need George's imagination and his vision if you're going to do make any progress at all. But you've got to be foolish to think you're going to make as much progress as he [imagines]," Mr Annas says.

American medical care is going broke as it is, he said. Adding more personalised treatment is only going to drive up the cost. And medicine may be able to add years to someone's life, but the quality of those years is unlikely to be good, warns Mr Annas.

Chad Nussbaum agrees.

"There's a statistical chance of being hit by a truck that's going to make it hard to live to 150 no matter how healthy you are," says Mr Nussbaum, co-director of the genome sequencing and analysis program at the Broad Institute of Harvard and MIT, a genetics research institute, where Church is an associate member.

Extreme aging isn't all about genetics, Mr Nussbaum says, it's basic engineering: parts just wear out over time. "It's wonderfully naive to think all we have to do is learn all the genetics and we'll live to be 150."

But Chad Nussbaum says he still admires Prof Church's vision and his "genius."

"It's a great thing to think big and try to do crazy things," says Mr Nussbaum. "If you don't try to do things that are impossible, we'll never accomplish the things that are nearly impossible."

“Will we all be tweaking our own genetic code?” Study Guide Questions Name_____

1. Professor Church thought up the idea to sequence the human_____.

2. Currently the price to sequence the human genome is below _____.

3. What would be some benefits of mapping the gene sequences in the human body?

4. According to Professor Church, “genetics is really about the _____ changes you can make to change your destiny.”

Evolution on Steroids

5. What is the machine called that scientists use to map the human genome?

Ethical Concerns

6. Why is synthetic biology nowhere near as scary as the hype?

7. Why do you think there are ethical concerns about the work of Professor Church?

Reality Check: read the following quote. "If you don't try to do things that are impossible, we'll never accomplish the things that are nearly impossible."

8. Do you agree with this statement? Why or why not?

Science Fair Research Tips for Success Name_____

Google and EBSCO search strategies.

1. The pages that are displayed highest in the search results have lots of other _____ linking to them.

2. Each link acts as a _____ to say, “This may be a good resource.”

3. Searching for fish doesn’t help much. You need to be more _____.

4. If you search for sand sharks without quotation marks, the search engine looks for pages with _____ and _____.

5. To get better results, put _____ around the words.

6. If a word has multiple meanings, put a _____ in front of the word you want to leave out.

The following website will create citations for you. All you need is the information from your source: citationmachine.net

Science Fair Research Tips for Success Name_____

Google and EBSCO search strategies.

1. The pages that are displayed highest in the search results have lots of other _____ linking to them.

2. Each link acts as a _____ to say, “This may be a good resource.”

3. Searching for fish doesn’t help much. You need to be more _____.

4. If you search for sand sharks without quotation marks, the search engine looks for pages with _____ and _____.

5. To get better results, put _____ around the words.

6. If a word has multiple meanings, put a _____ in front of the word you want to leave out.

The following website will create citations for you. All you need is the information from your source: citationmachine.net

Hutchinson, Alex. (2008). Is recycling worth it? *Popular Mechanics*, *185*(12).

This article was about how Americans feel it is important to recycle. New York City tries to recycle because all of their garbage is piling up and taking up space. However, it takes a lot of energy sources to power the trucks that recycle. This leads some to believe that recycling is not worth it.

Davies, T. (1998, September 07). Playing with the big boys. *Macleans*, *111*(36).

This article is about rock and roll. Chantal was an upcoming musician when the movie Armageddon was released. She was on the Armageddon soundtrack, and that helped boost her career. Chantal was on the soundtrack with Aerosmith and other big famous musicians.

Ray, E. (2006, August 07). Director takes arboretum to a new level. *Newspaper Source*.

This article was about Reg Noble, a director of a garden had a very nice garden. He focused on improving his garden staff. His gardens were very colorful and he took care of them.

Science Fair Write-Up Components Due March 28th

<u>Guidelines:</u> The write up needs to be single spaced, typed, 12-point, Times New Roman font. You must have a paper copy to turn in (1 per group). Most importantly, it needs to address the things listed below. This is worth 20 points of your science fair project grade.

Testable Question: *What is the question you are going to answer with this project, or what is your purpose?*

What I changed (independent variable): *What part of your experiment are you going to change in order to observe the effects of that change?*

What stayed the same (controlled variable): *What are you going to keep the same so that you can get accurate results?*

What I measured (dependent variables): *What is the final variable that you are going to measure? In other words, it "depends" on the other variables.*

Research: *This is where you include all your research that you did for this science fair project. Make sure you use proper citations, and include your bibliography in this section.*

Hypothesis: *State your hypothesis or if you have several, state several. It should be "If we (do this), (this will happen)."*

Materials: *This is where you list all of your materials that you will need for your science fair investigation. This includes all of your materials in the experiment, and for your presentation.*

Time: *How much time did it take for this science fair investigation? Consider all the preparation and experimentation.*

Procedure: *Describe exactly what you did in your experiment and how you did it. This should be a step-by-step process, numbering each step along the way.*

Data: *This is where you record any data from your experiment. This could be recording the color change in a flower, writing down times or hamster races, measuring the size of a grown plant etc.*

Results and Conclusion: *This should be in paragraph form. You need two paragraphs. One describes your findings from your experiment (these are your results). For example, did the smaller volcano actually have a smaller eruption?*

The second paragraph gives a conclusion for your experiment. This is where you decide if your hypothesis was correct or incorrect, and you explain why it was or why it wasn't.

Science Fair Project Rubric

Write-up (20 points)

Writing mechanics *5 points*

Your write-up is clearly edited for punctuation, grammar and spelling. There should be absolutely no errors. If you need to submit it before it is due for me to edit it, I will do so.

Content *15 points*

Your write-up includes the topics listed above. You must address all of the things on page 1 as we have talked about them in class. These components must be thoroughly completed.

Presentation (50 points)

Creativity/neatness *10 points*

You must have a creative/useful way of presenting your science fair project (poster board, PowerPoint, song, website, experiment demonstration etc.) Your work is neat and looks like you spent a lot of time on it.

Content *30 points*

You included all of the components from above (in write-up) in your presentation. These components are clearly described and make sense. You will describe how you went through the scientific process step-by-step.

Writing Mechanics/Voice *10 points*

Any writing included in your project must be clearly edited for punctuation, grammar and spelling. There should be absolutely no errors. You also must speak loud and clear enough for the audience to hear you.

70 Points Total

WISE the web-based inquiry science environment

Project WISE Instructions

1. Go to our Science Moodle Page, and scroll down to the Calendar.
2. On today's date, you will find two links. One says "Register for WISE" and another says "WISE Class."
3. First click on "Register for WISE." This will take you to a page where you are asked to type in some information.
4. Type in your first name, last name, gender, class period (hour), and a password that you can remember. Next, type in our class registration code: f6cfnm
5. Before you click "OK", write down your password and the above registration code on the first page of your agenda.
6. Click "Ok" and you will have successfully created a WISE account.
7. Write down your username in your agenda where you wrote your password and the registration code. Now you should have three things written in your agenda: registration code, password, and username.
8. Now go back to the Moodle Calendar.
9. Click on "WISE Class" located on the same date as the previous link.
10. Log-in using your newly-created username and password that you wrote in your agendas. You do not have to type in your registration code. If you forget your username and password, send Mr. M an email or talk to him in class. He will retrieve it for you. Forgetting a username and password is NOT AN EXCUSE FOR AN INCOMPLETE PROJECT.
11. After you log-in, you will see a project entitled: "Mitosis and Cell Processes." This is the first project we will complete this year. All other projects will be listed on this page when we get to them later in the year.
12. To begin the project, click on the "Mitosis and Cell Processes" link.
13. You are now on the project page. On the left, you will see an Index and the activity steps of the project. Make sure you don't work or click ahead because all the steps go in order.
14. Make sure you begin with the first step which is titled, "Meet the Scientist."
15. After completing each step, click on the one below it on the left side-bar menu. This will take you to the next step.
16. Every step that requires you to submit an answer or complete an activity needs to be done to the best of your ability. I can see all your work and WILL BE GRADING EACH COMPLETED STEP.

Genetic Mutation Project Rubric		
Demonstrates an understanding of DNA structure and mutations	Your DNA representation includes the following labels: 1. Chromosome 2. DNA strand 3. Gene 4. Base pair 5. Base 6. Key with the genetic code of all the super power mutations (15 different mutations)	10 Points
Includes all components	Include: -a key for which genes represent which super powers (mutations) -a visual of your mutant's DNA (includes labels of each part of a DNA strand-see above) -a visual representation of your mutant (model, picture etc.) -a title for the project	10 Points
Creativity and Effort	Your project shows that you put significant effort and thought into designing your mutant. It is neat and all words are carefully written/spelled. You have worked hard during the in-class work time and have not wasted valuable work time.	10 Points

Total Individual Grade_____/30

Mutant Creations!

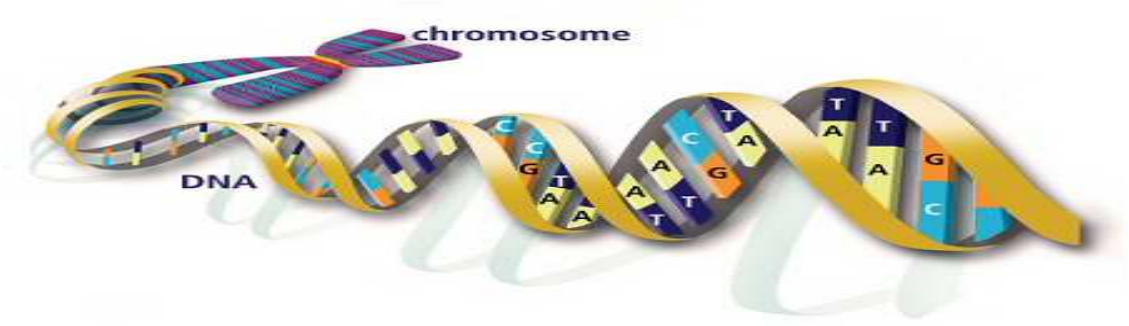
Project Description: This project is designed to get you thinking about the structure of DNA and the possibilities of genetic manipulation and mutations. Your job is to design a key that includes a different genetic code for 15 superpowers (you will have 15 different genes in your key). Then you will create a visual model of your mutant's DNA (with labels). You will also create a visual model of your mutant (the extra fun part!).

Partners of 2 Max!

Possible Materials: Markers, clay, paints, posters, pictures, cut up magazines, other art supplies, construction paper, textbook and other sources for understanding DNA.

Goal: To design well-crafted models of DNA structure and creative mutants to be hung around the classroom and in the hallways.

Visual Sample of DNA representation:



DNA Replication Activity Instructions

1. Create Nucluotide bracelets. Everyone wears a T, A, C, or G. Each letter has a different color.

2. Go outside to the tennis courts.

3. Explain that the tennis court is the nucleus and all students are the bases of DNA.

4. Create a DNA strand with half of the class by having them lock hands with the complementary base of another person (standing across from each other). Then put he other hand on the should of the person to one's side. This will create our human DNA strand.

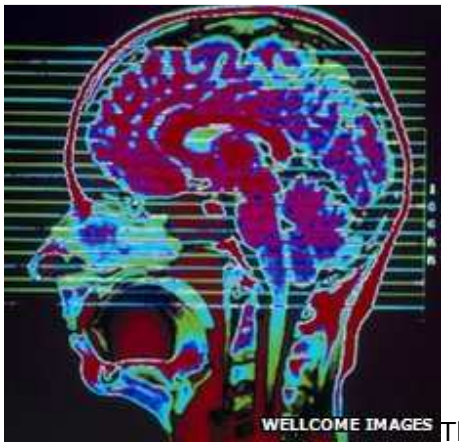
5. Simulate DNA replication by the teacher walking through the middle (teacher = heliocase). The strand then divides in half. The rest of the class (floating bases) are going to latch on to on half of the chain. The final product should be two identical DNA strands, and those two new DNA strands should be identical to what we started.

(If it doesn't work the first time, you might have to trade some nucleutides to make sure you have an even number for every base. It takes me at least three tries before we actually make a successful replication. When it doesn't work, you can explain that that's what happens when there is a mutation.)

(Articles Retrieved from bbc.com/health. Retrieved Nov. 20, 2011)

Directions: Read the articles below and answer the following questions. Print your completed questions to turn in on the appropriate due date. YOU MUST READ THE ARTICLES THOROUGHLY IN ORDER TO ANSWER THE QUESTIONS.

DNA gene find 'transforms' theories on how brain works



The genes are responsible for tiny changes in the DNA of brain tissue

Continue reading the main story

The genetic make-up of our brain cells changes thousands of times over the course of our lifetimes, according to new research.

Scientists at the Roslin Institute in Edinburgh have identified genes, called retrotransposons, responsible for tiny changes in the DNA of brain tissue.

They say their discovery completely overturns previous theories about how the brain works.

It could also increase understanding of conditions such as Parkinson's disease.

The study shows for the first time that brain cells are genetically different to other cells in the body, and are also genetically distinct from each other.

The research was carried out in collaboration with scientists from the Netherlands, Italy, Australia, Japan and the US.

They found that the retrotransposons were particularly active in areas of the brain linked to cell renewal.

Genetic changes

It is hoped that by mapping the location of these genes, scientists could identify mutations that impact on brain function and may cause diseases such as Parkinson's to develop.

The researchers are now investigating whether brain tumor formation and conditions which affect the memory, such as Alzheimer's, are associated with a change in retrotransposon activity.

Dr Geoff Faulkner, from the Roslin Institute, based at the University of Edinburgh, said: "This research completely overturns the belief that the genetic make-up of brain cells remains static throughout life and provides us with new information about how the brain works.

"If we can understand better how these subtle genetic changes occur we could shed light on how brain cells regenerate, how processes like memory formation may have a genetic basis and possibly link the activity of these genes to brain diseases."

The scientists' findings are published in the journal Nature.

Your Name_____

Complete and Print the Following questions Related to the above article.

1. According to this article, can some of our genes change over the course of our lives? Support your answer with evidence from the article.

2. Genes that are responsible for tiny changes in the DNA of the brain tissue are called_____.

3. Please explain this statement in your own words: "This research completely overturns the belief that the genetic make-up of brain cells remains static throughout life and provides us with new information about how the brain works."

Social gene spotted in 20 seconds, say researchers


People can judge a person's traits by studying them for just 20 seconds, the research suggests

Continue reading the main story

It is well known that first impressions count, but they may also be enough to give insights into a person's genes.

Researchers say people can spot whether a complete stranger has a certain "social gene" in just 20 seconds.

Two variants of the "oxytocin receptor gene" have been linked with social traits.

People judging the empathy of strangers - by studying the way they listened to people - predicted the genetic variant, a University of Toronto study showed.

The hormone oxytocin has a role in birth, production of milk and bonding between mother and baby.

It also seems to have a role in social skills and has variously been called the "love" or "cuddle" chemical.

Two variants of the oxytocin receptor gene - termed G and A - have been linked to social behavior.

Studies have shown that people with two copies of G, compared with one of each or two of A, are at lower risk of autism and report higher levels of empathy, positive emotions and said they were more social.

Silent movie

Twenty three couples were filmed for the **Proceedings of the National Academy of Sciences study**. One described a moment of personal suffering while their partner listened.

Strangers then watched a 20 second silent recording of the exchange and scored the listener for their "prosocial traits", such as a caring nature or empathy.

GG people were found to be more prosocial than AG or AA people.

In the top 10 most trusted people, six were GG. In the 10 least trusted people, nine had at least one copy of A.

One of the researchers, Dr Aleksandr Kogan from the University of Toronto, said: "Our findings suggest even slight genetic variation may have tangible impact on people's behavior, and that these behavioral differences are quickly noticed by others.

"Our study asked the question of whether these differences manifest themselves in behaviors that are quickly detectable by strangers, and it turns out they did."

Prof Sarina Rodrigues Saturn, from Oregon State University, said: "It was amazing to see how the data aligned so strongly by genotype.

"It makes sense that a gene crucial for social processing would yield these findings; other studies have shown that people are good at judging people at a distance and first impressions really make an impact."

Your name_____

Complete the following questions based on the article above. (print to hand in)

1. What is the name of the hormone in our body that is linked to social traits?

2. What effect would two copies of the oxytocin receptor “G” have on a human being? In other words, how would this person act around other people?

3. Based on this article, what do you think the word “prosocial” means in your own words?

Name_____

Favorite Celebrity_____

October Sky Movie Guide: They are not necessarily in order, but they should be completed throughout the duration of the movie. (Use a separate sheet of paper if you need more room)

1. For each of the following steps of the scientific method, please give a specific example from the movie in which the characters perform that step. (Two sentences for each step)

Purpose:

Research:

Hypothesis:

Experiment:

Analysis:

Conclusion:

2. Throughout the movie the students have different setbacks or problems. Explain two problems throughout the movie and how they overcome those problems.

3. If I told you that science requires curiosity, resiliency, hard work, and dedication, would you agree? Support your answer with examples from the movie. (Do this on back if you run out of room.)

4. Name two positive characteristics besides the ones from number 3 that were displayed in the movie. Then explain how those characteristics were displayed and how they relate to the 6 pillars of character. (You will not have enough room. Flip it over, and do this question on the back).

Food Web Assignment Model

Food Chain (5 different food chains)	Food Web (At least 30 different organisms)
Energy Pyramid (Create 2 energy pyramids for any two of your food chains.)	Explain what would happen if one part of your food web became extinct. Then draw what would happen below.

Middle School Science Fair (100 Points Total) Names of Group members_____

Explanation

The middle school science fair is designed to get you to think about how the world works, and to discover for yourself different scientific processes. In groups of 2, you will think of a decided on a topic, develop a question you want to answer about your topic, research the topic, create a hypothesis as to what is the answer to your question, and develop an experiment to try and prove your hypothesis. Eventually, you will come to a conclusion about the answer to your question. Please note: **THIS IS NOT AN INVENTION CONVENTION.** The point is not to invent something but to discover something new about the world. The point is to get you to question why things are the way they are, and then go search for the answers.

Guidelines

-Must be a project large enough to be worth 100 points. You should put in at least 14 hours outside of class researching, experimenting, collecting data and interpreting that data. (This is additional to the time you will get to work in class.)

-You must have all the required components (see below) More specifics will come later explaining each part.

-You must demonstrate your group's use of the scientific method.

Grading Rubric

Purpose (attached) 10 points

Formal Proposal 25 points

Research Paper 30

Final presentation 30

Group Contribution 5

Science Fair Purpose (Due October 28)

What is a science-related topic you are interested in that you would like to know more about? IT MUST BE RELATED TO LIFE SCIENCE.

What do you already know about your topic?

What do you want to know about your topic?

What is a general question you can ask about your topic?

What are 3 “testable” questions that you are thinking of exploring for the science fair project?

1.

2.

3.

Choose your favorite question, and from that question, develop a purpose of your science fair investigation.

Our purpose is to_____
_____.

Complete the checklist for your chosen purpose:

My science fair project will be completed by the end of the school year_____

I will be able to obtain all the materials needed to complete my project_____

The topic is something that I can understand_____

None of this project will be dangerous_____

No animals will be hurt during the duration of this project_____

Moodle Scavenger Hunt

Name_____

Period_____

1. **Go to http://www.kcparrish.edu.co/.**
    a. **This is the KCP webpage.**
2. **Log into Moodle from the KCP web page. To do this you need to click on the following:**
    a. **English**
    b. **Services**
    c. **Classrooms**
    d. **Middle-School**
    e. **Then under "courses," scroll down and find my name. First click on "Kevin Matuseski-Science."**
    f. **After clicking on the course name, you will have to log-in with your username and password (username=first initial followed by last name; password=123 or whatever you change it to).**

Questions for the Science page.

1. **What is the 1st picture of on the main page?**

2. **What is the 1st objective under "Class Content?" Write it out fully.**

3. **List the assignments that are already posted on the Moodle website.**

4. **When is the reading from the science textbook due?**

To get out of the science page, click on the blue "KCP" in the upper left corner. Then click on "Middle-School" again and log into the English page. It says "Kevin Matuseski-English."

Questions for the English page.

1. **What is the 1st picture on the main page?**

2. **List the assignments that are already posted on the Moodle Website.**

3. **What is the title of the first link under "notes"?**

4. **Click on the "Standards" link. What is standard 1.0 under the "Reading" heading. (Write out the entire boldfaced standard.)**

Science Fair Webquest!

REMEMBER! You must send this document to Mr. Matuseski before the end of the class period. 10 points possible.

Your Name:

Click on the "Science Fair Webquest" link under today's date on the Science Moodle page. When you come to the webpage, follow the steps below and answer all questions in this document.

Question 1: List the 6 steps of a science fair investigation.

-

-

-

-

-

-

Now, click on "Choose a project idea", and read the entire page including the tables.

Question 2: What sets up the science fair investigation?

-

A variable is something that could be changed in an experiment, but it could also stay the same. There are three types of variables: independent, controlled and dependant.

Question 3: Which variable changes in the experiment?

-

Question4: Which variable relies on the data collected?

-

Question 5: Which variable stays the same throughout the experiment?

-

Now, scroll up to the top and click on "How to Ask a Testable Question."

Question 6: True or False (underline one) Every science experiment should be focused on learning just one thing at a time.

Read the "What is a testable question" section.

Question 7: What is a testable question? Do not use the words "test" or "testable" in your answer.

-

Question 8: What is the key difference between a "general interest" science question and a "testable" science question?

-

Question 9: Think of a "general interest" science question, and write it below.

-

Question 10: Now think of a "testable" science question, and write it below.

-

Now, save this document to your desktop, and then send it to Mr. Matuseski as an email attachment.

THE END

http://school.discoveryeducation.com/sciencefaircentral/Science-Fair-Projects/Choose-a-Science-Fair-Project-Idea.html

(above is the link to the website)

Middle School Science Fair

Explanation

The middle school science fair is designed to get you to think about how the world works, and to discover for yourself different scientific processes. In groups of 2, you will think of a decided on a topic, develop questions you want to answer about your topic, research the topic, create a hypothesis as to what is the answer to your questions, and develop an experiment to try and prove your hypothesis. Eventually, you will come to a conclusion about the answer to your questions. Please not: THIS IS NOT AN INVENTION CONVENTION. The point is not to invent something but to discover something new about the world. The point is to get you to question why things are the way they are, and then to go search for the answers.

Guidelines

-Must be a project large enough to be worth 60 points. You should put in at least 12 hours outside of class researching, experimenting, collecting data and interpreting that data. (This is additional to the time you will get to work in class.)

-You must have all the required components (see below)

-You must demonstrate your group's use of the scientific method.

Timeline for Requirements

Oct. 4th- Hand in pre-plan

-Your pre-plan must be approved before you can move on to the next step.

Dec. 6th- Formal Proposal

-Basic methods-How you will go about conducting your experiment.

-Questions you want to answer, hypotheses, procedures

March 22-Project ready to present.

-Is displayed and able to present to class and at the fair.

-This could the take the form of a PowerPoint, a poster, a demonstration

-All notes and work outside of the actually presentation needs to be turned in.

March 23- Group evaluation

-You will fill out an assessment of your group members to turn in.

April 1st-Science Fair

Grading Rubric

Pre-plan 10 points

Formal Proposal 15 points

Final presentation 30

Group Contribution 5

Science Fair Pre-Planning

What is a science-related topic you are interested in that you would like to know more about?

What do you already know about your topic?

What do you want to know about your topic?

Now go to the computer lab, and search your topic. Try to answer what you want to know about your topic. Write down at least 30 lines of information that you did not know before researching.

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Science Fair Write-Up Components Due March 28th

<u>Guidelines:</u> The write up needs to be single spaced, typed, 12-point, Times New Roman font. You must have a paper copy to turn in (1 per group). Most importantly, it needs to address the things listed below. This is worth 20 points of your science fair project grade.

Testable Question: *What is the question you are going to answer with this project, or what is your purpose?*

What I changed (independent variable): *What part of your experiment are you going to change in order to observe the effects of that change?*

What stayed the same (controlled variable): *What are you going to keep the same so that you can get accurate results?*

What I measured (dependent variables): *What is the final variable that you are going to measure? In other words, it "depends" on the other variables.*

Research: *This is where you include all your research that you did for this science fair project. Make sure you use proper citations, and include your bibliography in this section.*

Hypothesis: *State your hypothesis or if you have several, state several. It should be "If we (do this), (this will happen)."*

Materials: *This is where you list all of your materials that you will need for your science fair investigation. This includes all of your materials in the experiment, and for your presentation.*

Time: *How much time did it take for this science fair investigation? Consider all the preparation and experimentation.*

Procedure: *Describe exactly what you did in your experiment and how you did it. This should be a step-by-step process, numbering each step along the way.*

Data: *This is where you record any data from your experiment. This could be recording the color change in a flower, writing down times or hamster races, measuring the size of a grown plant etc.*

Results and Conclusion: *This should be in paragraph form. You need two paragraphs. One describes your findings from your experiment (these are your results). For example, did the smaller volcano actually have a smaller eruption?*

The second paragraph gives a conclusion for your experiment. This is where you decide if your hypothesis was correct or incorrect, and you explain why it was or why it wasn't.

Science Fair Project Rubric

Write-up (20 points)

Writing mechanics *5 points*

Your write-up is clearly edited for punctuation, grammar and spelling. There should be absolutely no errors. If you need to submit it before it is due for me to edit it, I will do so.

Content *15 points*

Your write-up includes the topics listed above. You must address all of the things on page 1 as we have talked about them in class. These components must be thoroughly completed.

Presentation (50 points)

Creativity/neatness *10 points*

You must have a creative/useful way of presenting your science fair project (poster board, PowerPoint, song, website, experiment demonstration etc.) Your work is neat and looks like you spent a lot of time on it.

Content *30 points*

You included all of the components from above (in write-up) in your presentation. These components are clearly described and make sense. You will describe how you went through the scientific process step-by-step.

Writing Mechanics/Voice *10 points*

Any writing included in your project must be clearly edited for punctuation, grammar and spelling. There should be absolutely no errors. You also must speak loud and clear enough for the audience to hear you.

70 Points Total

Diet Analysis Assignment (Due Monday) **Name_____**

Step 1: Think about your diet, and answer the following questions.

1. What do you consume a lot? (be specific, if it is “candy” say the type)

2. Is there anything you consume that you think is unhealthy? How often do you consume it?

3. How often do you get sick? If not often, how do you think you stay healthy?

4. When does your body feel good, and when does it feel bad? What causes your body to feel good or bad? (Be specific)

5. What kinds of food and drink do you think make your body healthier?

Step 2: Looking at your answers from step 1, choose something you are especially interested in and would like to know more about. For example, if your body feels bad after eating a lot of sugar, perhaps you want to find out what sugar does to your body. If you think that carrots help you see better, maybe you want to research the effects of carrots.

Topic_____

Step 3: Create your research question. Once you have decided on a topic think of a question related to your topic to which you can research the answer. For example, if your topic is the amount of soda you drink, your question might be, “What are the harmful effects of soda?” or “What chemicals in soda harm our bodies?

Research Question_____

Step 4: Write down a possible answer to your question before you do the research. This is your hypothesis.

Hypothesis_____

Step 5: Research your topic by trying to find the answer to your questions. For example, if your topic is on the effects of soda, type in key words like "effects of soda," or "soda and the body." Take notes writing down everything you confirm or learn. Site your sources by filling in the below information. Do this step in your notebook, and you should have at least three sources. This means you will fill out all of the information at least three times. (copy the following information in your notebooks to organize your research) DON'T COPY FROM YOUR SOURCES WORD-FOR-WORD

Type of source (is it a webpage, book, journal article, magazine article etc.):

Title of source (list the title of the website, and the title of the article if there is both):

Author (if there is no author take a guess as to who might have written it):

URL (web address ie. www.dhe.com/hhh:

Date of the source (find out when the webpage was updates or your source was written):

Date you found the information (when did you search this website?):

Notes (write down notes in your own words that apply to your research question):

Body Systems Jigsaw Name_____

Description: Your group will be assigned a specific body system. You will become experts on your body system, and think of a creative way of teaching it to the class. Then you will teach the rest of the class the expert knowledge that you have gained so that everyone becomes knowledgeable about each system.

Guidelines:

1. You must state the basic functions of the system and explain in your own words how it helps the body.

2. Define key terms for the class so they can clearly see or hear the definitions.

3. Think of a **creative way** to teach all the information in your section of the chapter. (ie. Don't just stand up front and read information off of a poster) Get the class engaged, present information creatively, and ask questions to check to see if your classmates understand (assessment).

Rubric

Guideline	**Point Value**
You have created a visual representation to go along with your lesson, making sure it is neat and clear for the class to learn from. (This might be a poster, flash cards, model of your system etc.)	10
You have thoroughly covered the basic functions of your assigned body system, so that your classmates can understand.	5
You have taught the key vocabulary terms from your body system in a creative manner, and have checked for understanding.	5
You have put thought, effort, and **creativity** into how to teach your body system. (You might include interactive elements, in-class assignments, assessments, or games)	10 (You will each get a separate group participation grade also)

1. Skeletal System (p. 90-91)
2. Muscular System (p. 92-93)
3. Nervous System (p. 94-95)
4. Endocrine System (p. 96-97)
5. Digestive System (p. 98-99)
6. Circulatory system (p. 100)
7. Respiratory System (p. 101)
8. Immune System (p. 102-103)

(NOTE: create guided notes to keep audience engaged and writing notes)

Life – Mammals Movie Guide

Name_____

1. What animal can live in Antarctica permanently?

2. Being mammals, seals can generate what within their bodies?

3. What do most mammals feel their babies?

4. What animal is so active that it is permanently hungry?

5. What does the mammal aye-aye eat?

6. What animal can live in the barren Arctic Tundra?

7. What is the reindeers' worst enemy and why?

8. How long across is the wingspan of the giant, straw-colored fruit bat?

9. What do fruit-bats eat? ☺

10. What is a group of hyenas called?

11. What is a group of lions called?

12. When do social bonds begin in mammals?

13. How do polar bears find food?

14. What can be a disadvantage of living in groups?

15. Meerkats also live in groups but are more _____.

16. What is the secret to the Meerkat's success?

17. Where do elephant babies often get stuck?

18. What are three characteristics that all mammals share?

Life Movie Guide – Plants Name_____

1. What are the oldest living things on earth?

2. What is the fastest growing plant?

3. What sets plants and animals apart?

4. Why is it hard for a plant to survive on the forest floor?

5. How does the cat's crawl creeper grow taller?

6. What are the drawbacks of growing 50 meters above ground?

7. What gives the sundew its name?

8. What do digestive enzymes do?

9. How does the Venus Flytrap catch its food?

10. What is the purpose of flowers?

11. What defense mechanism does milkweed have against caterpillars?

12. How does Brunsvigia spread its seed (pollinate)?

13. What do you think "germinate" means?

14. How does Alsomitra spread its seed?

15. What pollinates the saguaro cactus?

16. How long does it take to go from a seed to a 5-centimeter tall cactus?

17. How does the dragon's blood tree survive the scorching heat?

18. How does the mangrove survive the salt water?

19. Why can pine trees survive much colder conditions?

20. What is the most successful flowering plant?

21. What covers more of the land than any other plant?

Observation- Outdoor Sctivity

Task: Explore the beauty of the KCP campus. Your task is to write down as many objective observations as you can. When we get back to class, you will be Reading your objective observations without actually saying the name of anything you are describing. The class will then try to guess what you have described.

(make sure to clarify what is subjective and what is objective before doing the activity.

Lesson 1- The Parts of a Vascular Plant ***Name_____***

Guided Notes ***Favorite afternoon activity_____***

Plants that have stems that are green and easy to bend are called _____plants.

_____ plants have rigid and strong stems. _____ and _____ are examples of these. They may lose their leaves in the winter, but the stems will not die.

_____ have stems that grow underground.

Stomata are small holes in the leaf of a plant. _____ cells open to allow _____ and water to exit the plant, and _____ _____ to enter.

Loss of water from the leaf is called _____. What do you think would happen if more water is lost through the leaves than is being taken in by the root?

_____

_____

Lesson 2- How do plants get and use energy?

_____ is the green substance in chloroplasts of the plant which enables the plant to make _____ or food.

_____ is stored in the glucose that is produced.

Carbon dioxide + _____ Light Energy $\xrightarrow[\text{Chlorophyll}]{}$ Glucose + _____

_____ is a waxy layer that covers the leaf and slows water loss.

Page 123- In the picture, where does photosynthesis take place? Draw a diagram here.

Cellular Respiration

This is the process in which cells break down _____ in order to release energy.

_____ is called the powerhouse of the cell because it is where the energy is produced in cellular respiration.

Lesson 3- How do plants grow?

_____ are seed plants that produce flowers.

Explain the difference between vascular and non-vascular plants?

Seeds form after pollination and fertilization and develop in the _____ of the plant in order to gain protection.

In gymnosperms seeds are grown in _____ cones.

What are some common uses that humans make for Gymnosperms and Angiosperms?

_____ is when a plant begins to grow from a seed.

Compare and Contrast Spores and Seeds		
Spores	*Similarities*	*Seeds*

_____ is a plant behavior caused by growth toward or away from something in the environment.

Plant Art Project **Name**_____

Description: In this project, you will design a plant. The plant itself does not actually have to exist in real life; however, you must be able to show and describe the basic parts and functions of real plants. For instance, all plants need to get energy from somewhere, and they need certain parts in order to function and be considered plants. Plants also need sunlight, water, and soil, and you will have to figure a way for your plant to acquire those things as well. Below is a rubric for the project:

Plant Project Rubric

Requirement	Description	Point Value
Labels and Accuracy of Drawing You have drawn and labeled all of the required components (see description).	Include: Epidermis Xylem Phloem Stem Roots Guard Cells Stoma Chloroplasts/Chlorophyll	5
Presentation You have explained the processes that take place in your plant which are necessary for its survival and growth (see description).	Explain the following: Photosynthesis Transpiration Cellular Respiration Germination	5
Creativity and Effort Your plant is unique and you have put time and effort into making the drawing realistic and believable.	Creativity and effort can come in many forms. A simple pencil sketch done in 5 minutes will not get many points. Be creative and put some thought and color into creating a plant model that can be used to teach the class.	5
Quality Points You have included extra information from chapter 5 aside from what is required above.	This may include a discussion of angiosperm versus gymnosperm, or an explanation of how your plant pollinates etc.	5 Extra

_____/ 15 Total

Save this rubric and turn it in with your project. This is the grade sheet that Mr. M will use.

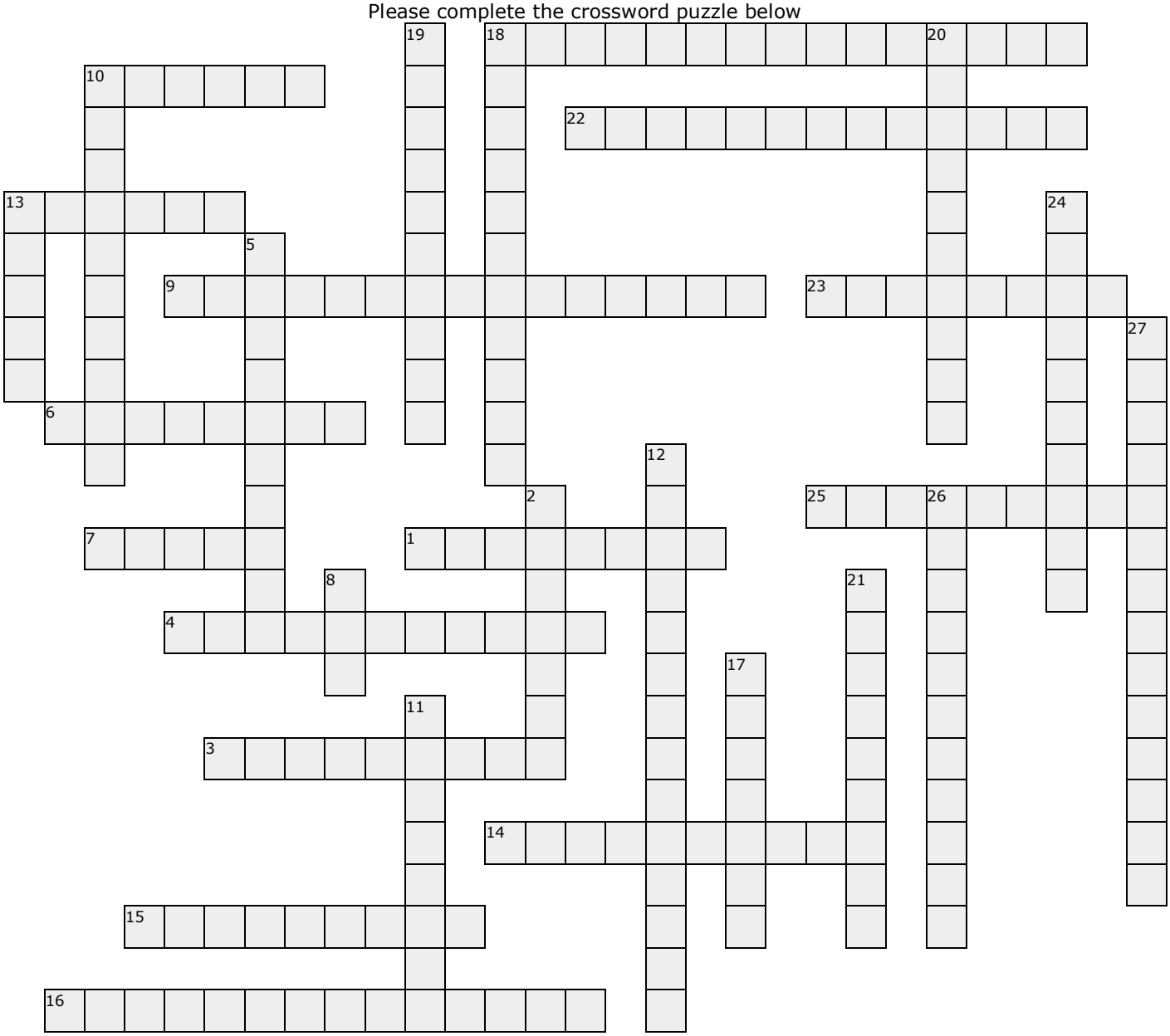
Teacher Comments:

Name: _____

Provided By: TheTeachersCorner.net Crossword Maker

Classification Chapter 1

Please complete the crossword puzzle below



Across:

1. First person to group organisms into kingdoms.
3. The gorilla belongs to this phylum.
4. Sea stars are in this phylum.
6. The most common classification system today is based on 6_____.
7. many-celled organisms that often grow in moist, dark places.
9. Some groups of organisms share many of the same_____.
10. Plants and animals all require a source of _____.
13. Can trap the sun's energy to produce glucose.
14. Have a single body opening that is usually surrounded by a ring of stinging cells.
15. The part of the earth that can support all living things.
16. The grouping of things according to their similarities.
18. Have tubes for carrying water throughout the plant.
22. There are over 980,000 species of these.
23. There are over 200000 known species of these.
25. The state Mr. Matuseski is from.

Down:

2. Get energy by eating other organims or their remains.
5. Scrapes algae off coral for food.
8. Protists have this many cells.
10. Bacteria that also make vitamins in the human body.
11. single-celled organisms that do not have a nucleus.
12. The scientific name for a horse.
13. The animal kingdom is divided into 35 different _____.
17. Members can mate with one another and can produce offspring that can produce offspring.
18. Mammals are _____ because they have a backbone.
19. Contains only insects with two pairs of wings that meet in the back.
20. A characterstic that enables an organism to survive and reproduce in its environment.
21. Scientists name about 10000 new _____ every year.
24. Have jointed legs, a body divided into segments, and a hard outer skeleton.

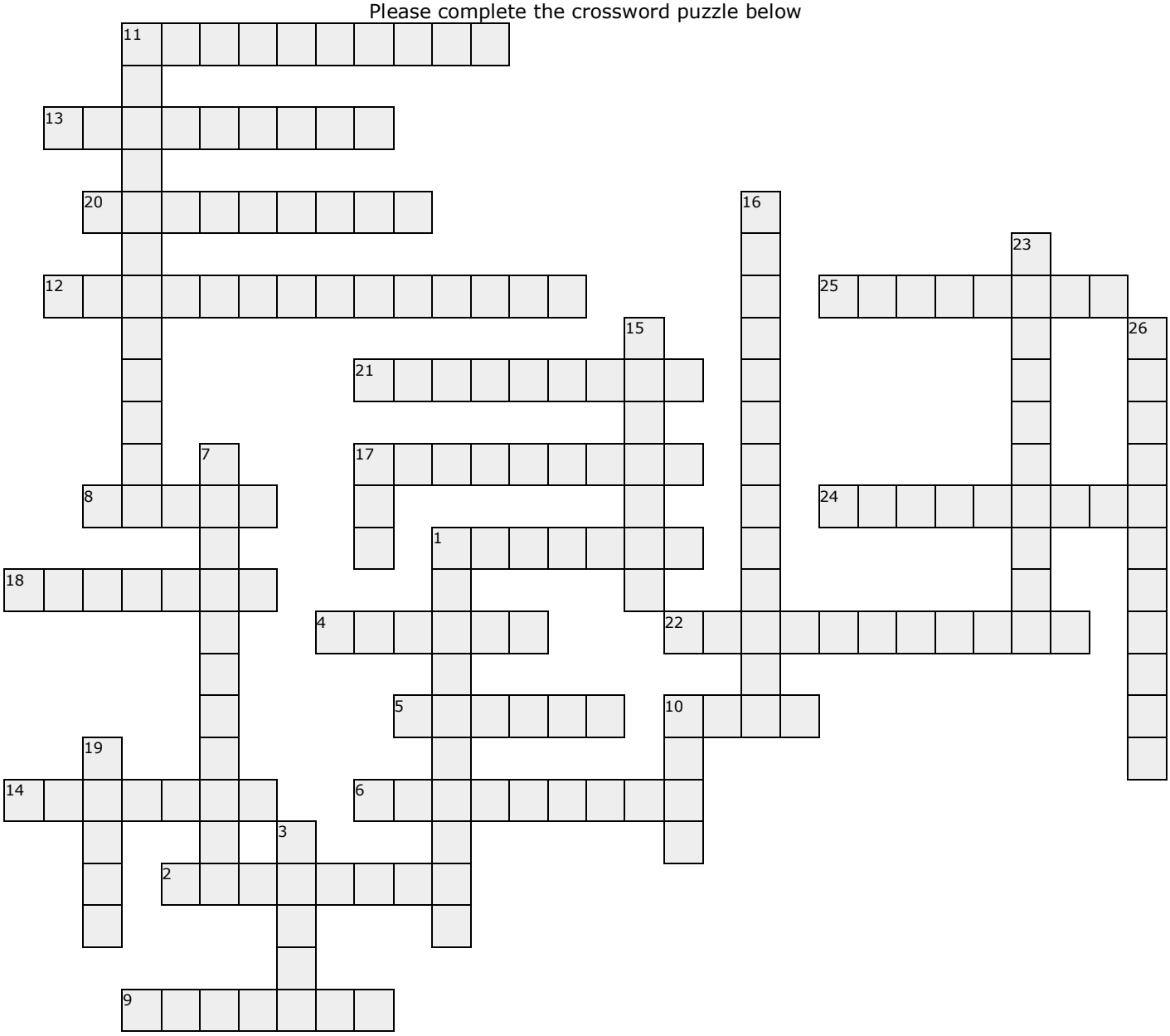
26. In these plants, materials pass from one cell to another.
27. Can grow in water that is ten times saltier than sea water.

Name: _____

Provided By: TheTeachersCorner.net Crossword Maker

Cells Chapter 2

Please complete the crossword puzzle below



Across:

1. The diffusion of water across the cell membrane.
2. Contains powerful chemicals that break down harmful molecules and recycle worn-out cell parts.
4. The cell constantly uses this element.
5. Cells must obtain nutrients and what in order to stay alive?
6. Lies outside the cell membrane and provides support for cell.
8. Two-thirds of the mass of a cell is _____.
9. Directs the cell's activities.
10. The material in which the first cells were discovered.
11. The machine used by Hooke to see the cork cells.
12. Plants need chlorophyll to carry this out.
13. The fluid substance that contains the organelles.
22. This is where plants make food.
24. The Endoplasmic _____ serves as the cell's transport system.
25. Begins the process of making proteins.

Down:

1. Structures that perform specific functions within the cell.
3. Man that first discovered cells.
7. All living things are made up of one or more cells, is part of the ___ _____.
10. The smallest unit that can carry out all the activities of life.
11. Convert the chemical energy of food into a form that the cell can use.
15. Cells make new cells through a process called _____.
16. Another way to say, Made of many cells.

14. Stated that all new cells come from an already-existing cell.
17. Movement of a substance from an area of high concentration to low concentration.
18. Stores water and nutrients and helps digest the cell's food.
20. Concluded that all plants are made of cells.
21. After the cell copies its DNA, it becomes_____.

17. Stores coded information about how an organism will grow and develop.
19. Discovered the cell nucleus.
23. Mitosis is this kind of process.
26. Tightly-coiled DNA strands.

Science Fair Initial Inquiries, purpose, and testable questions

Name_____

Write down 10 questions that you wonder about the natural world:

1.

2.

3.

4.

5.

The Purpose Statement should explain what it is you are trying to discover or prove. The Purpose should be written in a form of a statement. Try to make your statement original and creative.

The statement should clearly explain:

1. The problem that you are trying to solve with your experiment.
2. Why you want to do this experiment.
3. How you think the information gained from the experiment will help other people.

Example of a Purpose Statement:

The purpose of this experiment was to find out how the density of plant cover affects soil erosion. I became interested in this experiment when the hillside next to our yard began to erode. The information from this experiment will help people to determine how many plants they should plant on their yards hillside.

Fill in the blanks below to create a quality Purpose Statement.

The purpose of this experiment was to _____
_____

I became interested in this experiment when
_____
_____

The information gained from this experiment will help others by _____
_____
_____

Testable Questions Guided Notes:

What is a testable question?

A testable question is one that can be _____ by designing and conducting an experiment.

A testable question always has the same format.

How does _____ affect _____?

Independent Variable Dependant Variable

When determining whether a question is testable, always identify the independent and dependent variables first.

What is a testable answer?

A _____answer to a testable question.

States how the _____ variable affects the _____ variable.

Create 3 possible testable questions that attempt to accomplish your purpose:

Question 1:

Independent Variable_____Dependent Variable_____

Question 2:

Independent Variable_____Dependent Variable_____

Question 3:

Independent Variable_____Dependent Variable_____

Science Fair Write-Up Components Due June 4th

<u>Guidelines:</u> The write up needs to be single spaced, typed, 12-point, Times New Roman font. You must have a paper copy to turn in (1 per group). Most importantly, it needs to address the things listed below. This is worth 20 points of your science fair project grade.

Testable Question: *What is the question you are going to answer with this project, or what is your purpose?*

What I changed (independent variable): *What part of your experiment are you going to change in order to observe the effects of that change?*

What stayed the same (controlled variable): *What are you going to keep the same so that you can get accurate results?*

What I measured (dependent variables): *What is the final variable that you are going to measure? In other words, it "depends" on the other variables.*

Research: *This is where you include all your research that you did for this science fair project. Make sure you use proper citations, and include your bibliography in this section.*

Hypothesis: *State your hypothesis or if you have several, state several. It should be "If we (do this), (this will happen)."*

Materials: *This is where you list all of your materials that you will need for your science fair investigation. This includes all of your materials in the experiment, and for your presentation.*

Time: *How much time did it take for this science fair investigation? Consider all the preparation and experimentation.*

Procedure: *Describe exactly what you did in your experiment and how you did it. This should be a step-by-step process, numbering each step along the way.*

Data: *This is where you record any data from your experiment. This could be recording the color change in a flower, writing down times or hamster races, measuring the size of a grown plant etc.*

Results and Conclusion: *This should be in paragraph form. You need two paragraphs. One describes your findings from your experiment (these are your results). For example, did the smaller volcano actually have a smaller eruption?*

The second paragraph gives a conclusion for your experiment. This is where you decide if your hypothesis was correct or incorrect, and you explain why it was or why it wasn't.

Science Fair Project Rubric

Write-up (20 points)

Writing mechanics 5 points

Your write-up is clearly edited for punctuation, grammar and spelling. There should be absolutely no errors. If you need to submit it before it is due for me to edit it, I will do so.

Content *15 points*

Your write-up includes the topics listed above. You must address all of the things on page 1 as we have talked about them in class. These components must be thoroughly completed.

Presentation (50 points)

Creativity/neatness *10 points*

You must have a creative/useful way of presenting your science fair project (poster board, PowerPoint, song, website, experiment demonstration etc.) Your work is neat and looks like you spent a lot of time on it.

Content *30 points*

You included all of the components from above (in write-up) in your presentation. These components are clearly described and make sense. You will describe how you went through the scientific process step-by-step.

Writing Mechanics/Voice *10 points*

Any writing included in your project must be clearly edited for punctuation, grammar and spelling. There should be absolutely no errors. You also must speak loud and clear enough for the audience to hear you.

70 Points Total

Research Stage: *Name:*_____

Directions:

Using the key terms you devised from your purpose and testable questions, search EBSCO and Google for research relating to your topic. The purpose of this stage is to find out as much as you can about your topic before you get to the experimental stage.

Key terms used to research: _____ _____ _____ _____ _____

EBSCO Research:

Citation 1:

Information:

-

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-

Citation 2:

Information:

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Citation 3:

Information:

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-

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Google Research:

Citation 1:

Information:

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Citation 2:

Information:

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Print Resources:

Citation 1:

Information:

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Research Stage: *Name:_____*

Directions: Topic- How does stress affect physical health?

Using the key terms you devised from your purpose and testable questions, search EBSCO and Google for research relating to your topic. The purpose of this stage is to find out as much as you can about your topic before you get to the experimental stage.

Key terms used to research: Stress and disease, health and stress, pathological sickness, causes of diseases, affects of stress

EBSCO Research:

Citation 1:

Cooney, C. M. (2011). Stress-Pollution Interactions: An Emerging Issue in Children's Health Research. *Environmental Health Perspectives*, *119*(10), A430.

Information:

- Stress might be associated with lowering the immune system (Cooney 2011).

- Stress might affect the child immune system development and it's response to pollutants (Cooney 2011).

- Stress throws our bodies out of balance (Cooney 2011).

-Stress can have effects on us in any age, but scientists suggest that it could be even worse at critical stages in development like childhood or pregnancy (Cooney 2011).

Citation 2:

Lafferty, K. D. (2003). How should environmental stress affect the population dynamics of disease?. *Ecology Letters*, *6*(7), 654. doi:10.1046/j.1461-0248.2003.00480.x

Information:

-Stress can increase the host's capacity to carry an infectious disease (Lafferty 2003).

-It is difficult to measure the effects of stress on disease because disease also has an effect on stress (Lafferty 2003).

-The impact of certain diseases increased with stress (Lafferty 2003).

-The study showed how stress affects certain populations (Lafferty 2003).

Citation 3:

Information:

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Google Research:

Citation 1:

World Stress Organization (2009). “How does stress cause disease?” Retrieved May 7, 2012,

http://www.worlstressorg.org.

Information:

- Stress weakens our immune system and makes us more susceptible to disease (WSO 2009)

- When we are stressed are body is more provoked and we wear ourselves out. Therefore, when we are no longer running on adrenaline our body trys to make up for the lots adrenaline (WSO 2009)

-

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Citation 2:

Information:

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Print Resources:

Citation 1: Gerber, H. (2008) Why stress is bad. Harcourtford inc. retrieved from the KCP library.

Information:

- “The majority of diseases are caused by stress, which makes the main prevention of diseases to avoid any and all stress” (Gerber 2008 pg. 36).

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Investigation Project

Title: For the Birds: The Impact of Food and Feeders on Attracting Songbirds

Testable Question: What is the best kind of food and feeder to attract the most birds?

What I changed (Independent variables): type of bird feeder, type of food

What stayed the same (Controlled Variables): location of feeders, amount of food

What I measured: (Dependent variables): the number of birds who visited each feeder

Research:
There are lots of birds in the state where I live. I did an internet search and found out that northern cardinals, goldfinches, titmice, chickadees, jays, grackles, and nuthatches are just a few of the types of birds I might see in our area. http://www.berkscountyweb.com/Birds/index.htm
What is the best type of food to put in a bird feeder to attract the most birds? I did some research using resources from the National Audubon society http://www.audubon.org/ to find out more about bird watching. I learned that different birds prefer different feeders and different food. Types of bird feeders include:

ground feeders (screen bottom trays that sit several inches off the ground or on a deck)

sunflower-tube feeders that hang off the ground

suet feeders that have a pudding like food with seeds and hang off the ground

hopper feeders (bird hopping on the feeder triggers the release of seeds)

thistle feeders (contain tiny holes that make seed available to only small beaked finches)

After reading about the feeders I discovered that suet should be avoided during hot weather because it can turn rancid. Ground feeders should be placed in open areas at least 10 feet from the nearest tree or bush so that birds have a chance to flee predators. Tube feeders should have a metal port around the seed dispensers to protect the food from squirrels. Doves, sparrows, goldfinches and cardinals tend to like ground feeders. Chickadees, titmice, nuthatches and goldfinches tend to like tube feeders. Jays, grackles, and red-winged blackbirds and cardinals tend to frequent hopper feeders. Goldfinches and redpolls tend to like thistle feeders.
I read more about food and learned that sunflower seeds, millet, cracked corn, oats, thistle and peanuts are all foods that birds might eat. I decided not to use peanuts because I am allergic

to peanuts. When I learned how expensive thistle was, I decided to go with other options. I also did not want to run the risk of food rotting, so I did not choose cracked corn or suet.
In the end, I decided the best foods to use might be hulled sunflower seeds (to attract jays, goldfinches, cardinals, chickadees, titmice, nuthatches, and grackles), millet (to attract sparrows, red-winged blackbirds, and a seed mixture to attract a great variety of songbirds.

Hypothesis:

If a mixture of bird seed is used then more birds will be observed.

Why I think so:

I think this because research says that certain birds like certain foods so increasing the food variety will increase the variety of birds that will come to that feeder.

Materials:

binoculars

bird feeders (ground feeder, hopper feeder, and tube feeder)

millet

hulled sunflower seeds

bird seed mixture (sunflower seeds, millet, oats)

watch/timer

Procedure:

1.
Set up bird feeders outside the wooded area near our school. Include 3 ground feeders (one with hulled sunflowers, one with millet, one with a mixture); 3 hopper feeders on poles (one with hulled sunflowers, one with millet, one with a mixture); and 3 tube feeders hung from nearby trees (one with hulled sunflowers, one with millet, one with a mixture).

Over a time span of 2 weeks (10 school days) observe the feeders for 20 minutes during lunch time.(12:00 pm)

Record the total number of birds and the feeders from which they eat. Use a group of friends to help make the observations. Refill the feeders as necessary.

Data Table: Ten Day Record of Birds Visiting the Feeders

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Ground feeder sunflower	2G	1C	NONE	NONE	1C	3G	1C 1G	1C	1C	1C
Ground feeder millet	NONE	NONE	NONE	1RB	NONE	NONE	NONE	NONE	NONE	1RB
Ground feeder mixture	1G	1C	NONE	1G	1G	1C	2G	3G	4G	5G
Hopper feeder sunflower	1G	NONE	NONE	2GR	2CH	1J	1GR	1C 2GR	2G	1GR 3G
Hopper feeder millet	NONE	NONE	NONE	NONE	1RB	NONE	NONE	NONE	1RB	NONE
Hopper feeder mixture	NONE	1GR	NONE	NONE	1GR	1J	1C	1J	2GR	1J 1GR 1RB
Tube feeder sunflower	1N	1C	NONE	1G	1G	1G 1N	NONE	2G 1N	1G 2CH	1G

Tube feeder millet	NONE	NONE	NONE	NONE	1RB	NONE	NONE	NONE	1RB	NONE
Tube mixture	NONE	NONE	NONE	1G	1C	1N 3G	2N 3CH	1T 1N	2N 1G	1C 3G
Total number of birds that visited*	**4**	**3**	**0**	**5**	**6**	**6**	**8**	**9**	**12**	**9**

Science Fair Write-up (First Stages) Due Friday, May 18 Name_____

Directions: This is your final draft of all the steps we have complete so far. Type up each section paying close attention to grammar, punctuation, spelling and the correct way to do each section. Remember how we discussed each section in class. For example, your testable questions should be in the format "How does _____ affect _____?" *Submit to the Moodle "Turnitin" drop box entitled "Science Fair Write-up."*

Initial Inquiry Question(s):

Purpose:

Research Key Terms:

Research Paper:

Testable Question (s):

Hypothesis (Predicted answer to testable question):

Experiment (How do you plan to test your hypothesis?):

Step 1:

Step 2:

Etc.