emergency sub plans



biology roots

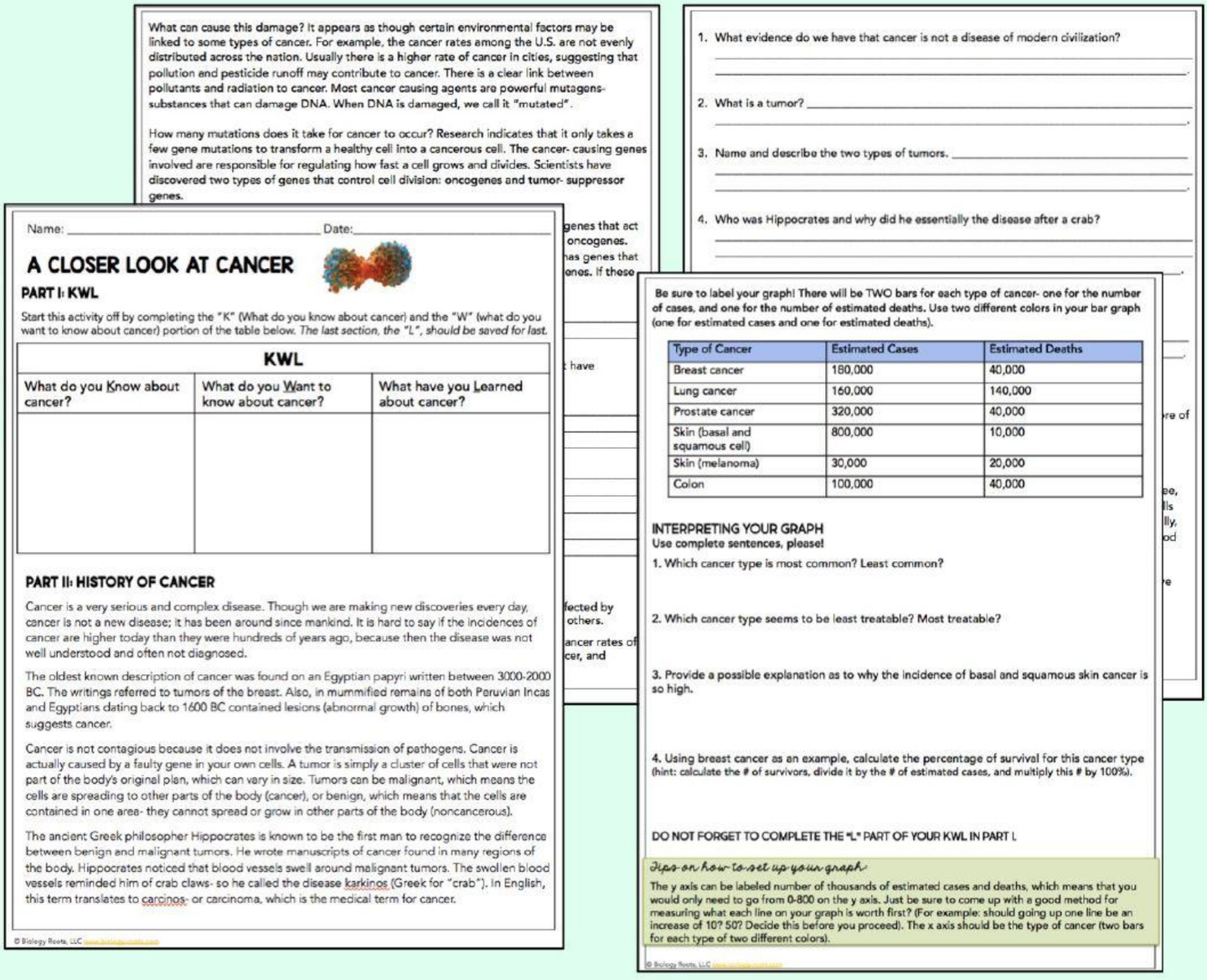
VOLUME I PLANS A-E
SET OF 5 SCIENCE PLANS

- Sub plans are long enough to last the entire class
- Relevant topics that relate to students
- CCSS aligned for literacy in science

PLAN "A": AN INSIDE LOOK AT CANCER

An Inside Look at Cancer

- -Reading and Graphing exercise
- -KWL, History of Cancer, What is Cancer, Graphing: Cancer Types Cases vs. Deaths
- 5 pages including graphing exercise



What can cause this damage? It appears as though certain environmental factors may be linked to some types of cancer. For example, the cancer rates among the U.S. are not evenly distributed across the nation. Usually there is a higher rate of cancer in cities, suggesting that pollution and pesticide runoff may contribute to cancer. There is a clear link between pollutants and radiation to cancer. Most cancer causing agents are powerful mutagens- substances that can damage DNA. When DNA is damaged, we call it "mutated".

How many mutations does it take for cancer to occur? Research indicates that it only takes a few gene mutations to transform a healthy cell into a cancerous cell. The cancer- causing genes involved are responsible for regulating how fast a cell grows and divides. Scientists have discovered two types of genes that control cell division: oncogenes and tumor- suppressor genes.

1. What evidence do we have that cancer is not a disease of modern civilization?
2. What is a tumor?
3. Name and describe the two types of tumors.
4. Who was Hippocrates and why did he essentially the disease after a crab?

Name: Date:

A CLOSER LOOK AT CANCER

PART I: KWL

Start this activity off by completing the "K" (What do you know about cancer) and the "W" (what do you want to know about cancer) portion of the table below. *The last section, the "L", should be saved for last.*

KWL		
What do you Know about cancer?	What do you Want to know about cancer?	What have you Learned about cancer?

PART II: HISTORY OF CANCER

Cancer is a very serious and complex disease. Though we are making new discoveries every day, cancer is not a new disease; it has been around since mankind. It is hard to say if the incidences of cancer are higher today than they were hundreds of years ago, because then the disease was not well understood and often not diagnosed.

The oldest known description of cancer was found on an Egyptian papyri written between 3000-2000 BC. The writings referred to tumors of the breast. Also, in mummified remains of both Peruvian Incas and Egyptians dating back to 1600 BC contained lesions (abnormal growth) of bones, which suggests cancer.

Cancer is not contagious because it does not involve the transmission of pathogens. Cancer is actually caused by a faulty gene in your own cells. A tumor is simply a cluster of cells that were not part of the body's original plan, which can vary in size. Tumors can be malignant, which means the cells are spreading to other parts of the body (cancer), or benign, which means that the cells are contained in one area- they cannot spread or grow in other parts of the body (noncancerous).

The ancient Greek philosopher Hippocrates is known to be the first man to recognize the difference between benign and malignant tumors. He wrote manuscripts of cancer found in many regions of the body. Hippocrates noticed that blood vessels swell around malignant tumors. The swollen blood vessels reminded him of crab claws- so he called the disease karkinos (Greek for "crab"). In English, this term translates to carcinos- or carcinoma, which is the medical term for cancer.

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Be sure to label your graph! There will be TWO bars for each type of cancer- one for the number of cases, and one for the number of estimated deaths. Use two different colors in your bar graph (one for estimated cases and one for estimated deaths).

Type of Cancer	Estimated Cases	Estimated Deaths
Breast cancer	180,000	40,000
Lung cancer	160,000	140,000
Prostate cancer	320,000	40,000
Skin (basal and squamous cell)	800,000	10,000
Skin (melanoma)	30,000	20,000
Colon	100,000	40,000

INTERPRETING YOUR GRAPH
Use complete sentences, please!

1. Which cancer type is most common? Least common?
2. Which cancer type seems to be least treatable? Most treatable?
3. Provide a possible explanation as to why the incidence of basal and squamous skin cancer is so high.
4. Using breast cancer as an example, calculate the percentage of survival for this cancer type (hint: calculate the # of survivors, divide it by the # of estimated cases, and multiply this # by 100%).

DO NOT FORGET TO COMPLETE THE "L" PART OF YOUR KWL IN PART I.

Tips on how to set up your graph

The y axis can be labeled number of thousands of estimated cases and deaths, which means that you would only need to go from 0-800 on the y axis. Just be sure to come up with a good method for measuring what each line on your graph is worth first? (For example: should going up one line be an increase of 10? 50? Decide this before you proceed). The x axis should be the type of cancer (two bars for each type of two different colors).

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Name: _____ Date: _____

A CLOSER LOOK AT CANCER

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	100,000	40,000

...G YOUR GRAPH
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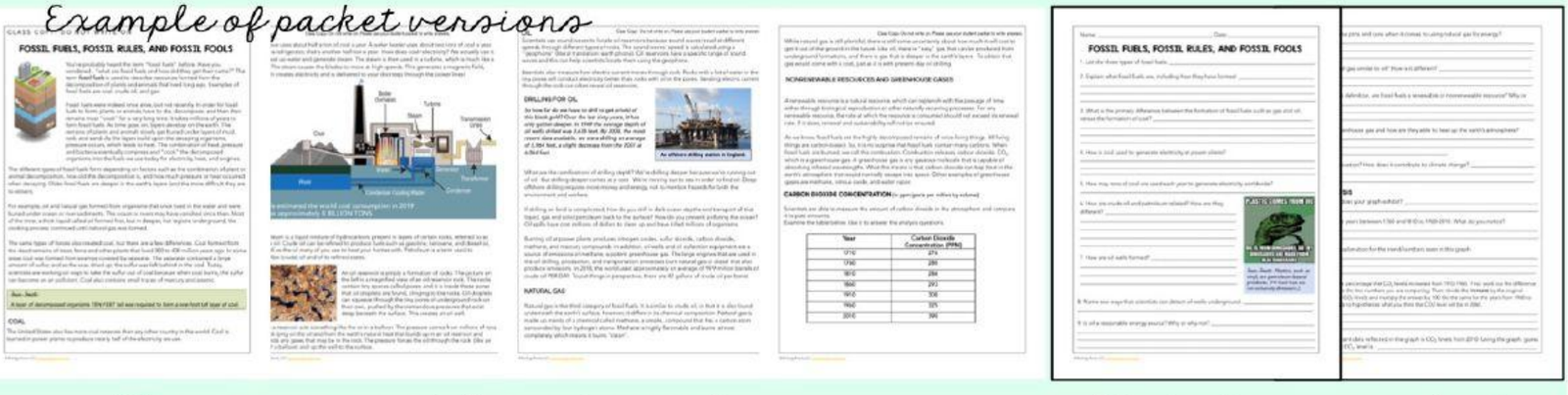
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...your graph:
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Students learn all about cancer (including the history and cause). A bar graph is included with easy-to-follow, clear directions.

ANSWER KEY AND CLASS PACKET VERSION INCLUDED

Example of packet versions



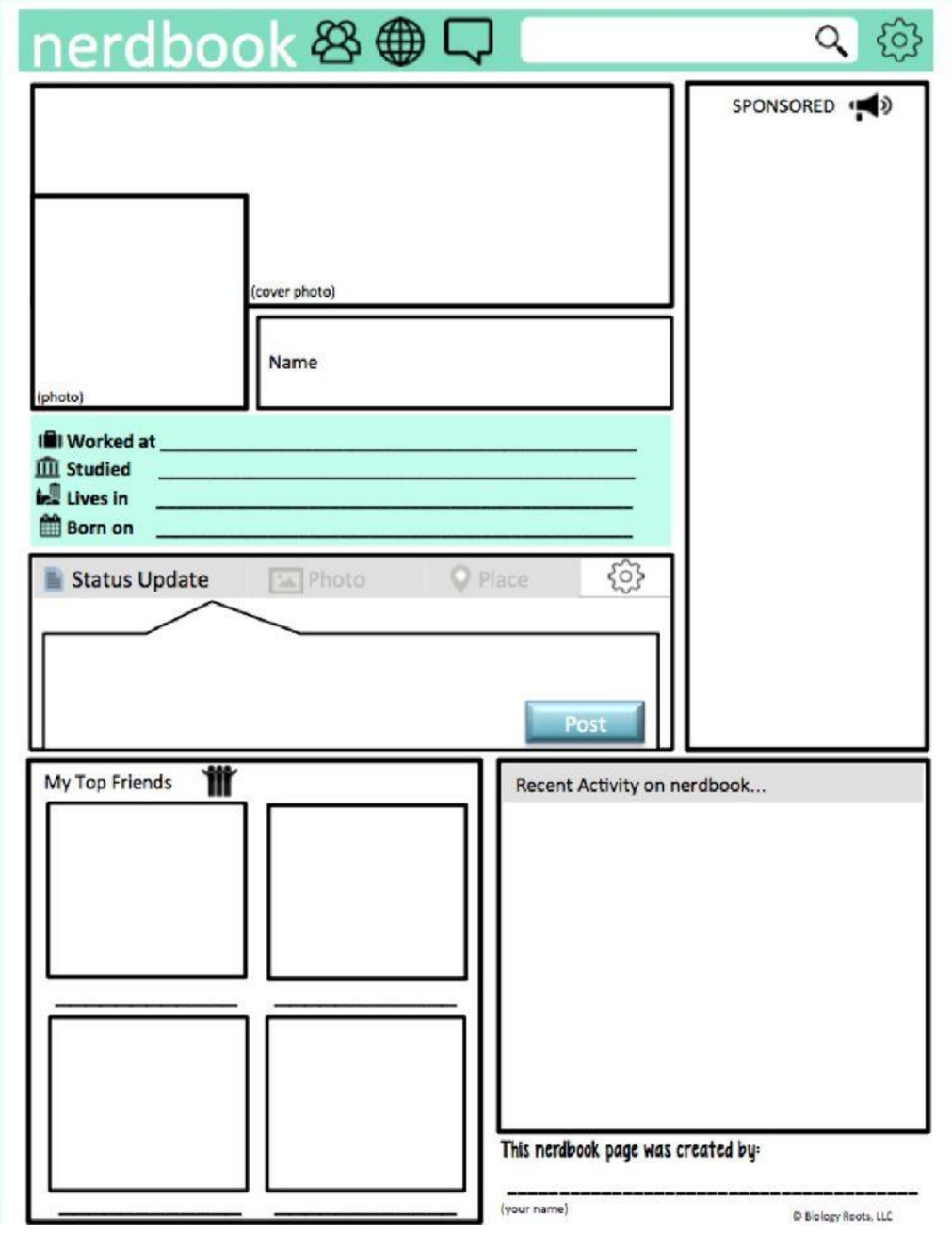
Classroom set (print once)

Student answer sheets

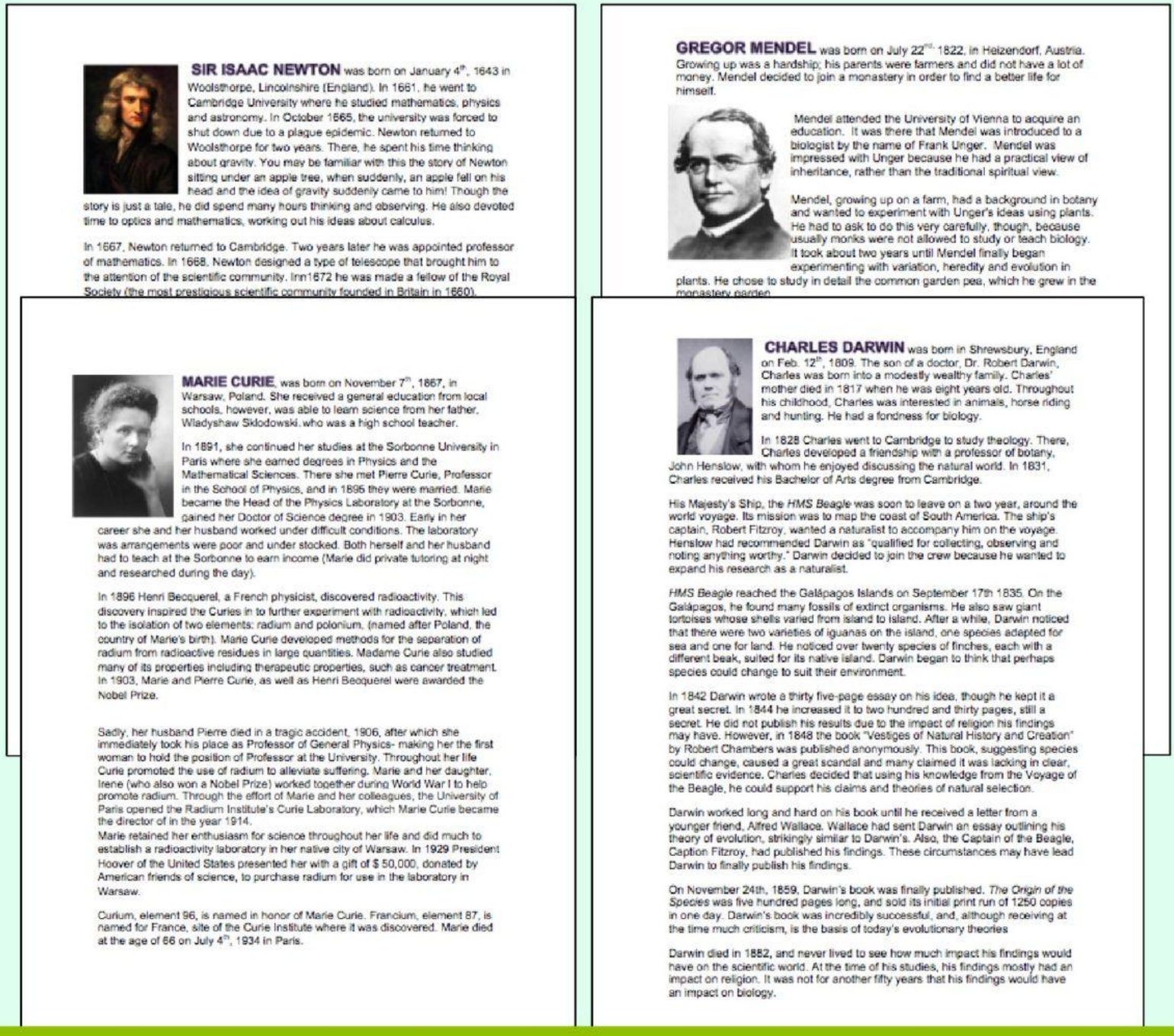
PLAN "B": SOCIAL MEDIA FOR SCIENTISTS

NERD book page for scientists

- -Students must make Facebook pages for one (or two) of the following scientists: Gregor Mendel, Charles, Darwin, Isaac Newton, Marie Curie.



- Students use the biographies to create the scientist's Facebook page (1 per student).
- Rubrics also included.



SIR ISAAC NEWTON was born on January 4th, 1643 in Woolsthorpe, Lincolnshire (England). In 1661, he went to Cambridge University where he studied mathematics, physics and astronomy. In October 1665, the university was forced to shut down due to a plague epidemic. Newton returned to Woolsthorpe for two years. There, he spent his time thinking about gravity. You may be familiar with this the story of Newton sitting under an apple tree, when suddenly, an apple fell on his head and the idea of gravity suddenly came to him! Though the story is just a tale, he did spend many hours thinking and observing. He also devoted time to optics and mathematics, working out his ideas about calculus.

In 1667, Newton returned to Cambridge. Two years later he was appointed professor of mathematics. In 1668, Newton designed a type of telescope that brought him to the attention of the scientific community. Inn1672 he was made a fellow of the Royal Society (the most prestigious scientific community founded in Britain in 1660).

GREGOR MENDEL was born on July 22nd, 1822, in Heizendorf, Austria. Growing up was a hardship; his parents were farmers and did not have a lot of money. Mendel decided to join a monastery in order to find a better life for himself.

Mendel attended the University of Vienna to acquire an education. It was there that Mendel was introduced to a biologist by the name of Frank Unger. Mendel was impressed with Unger because he had a practical view of inheritance, rather than the traditional spiritual view.

Mendel, growing up on a farm, had a background in botany and wanted to experiment with Unger's ideas using plants. He had to ask to do this very carefully, though, because usually monks were not allowed to study or teach biology. It took about two years until Mendel finally began experimenting with variation, heredity and evolution in plants. He chose to study in detail the common garden pea, which he grew in the monastery garden.

MARIE CURIE, was born on November 7th, 1867, in Warsaw, Poland. She received a general education from local schools, however, was able to learn science from her father, Wladyshaw Sklodowski, who was a high school teacher.

In 1891, she continued her studies at the Sorbonne University in Paris where she earned degrees in Physics and the Mathematical Sciences. There she met Pierre Curie, Professor in the School of Physics, and in 1895 they were married. Marie became the Head of the Physics Laboratory at the Sorbonne, gained her Doctor of Science degree in 1903. Early in her career she and her husband worked under difficult conditions. The laboratory was arrangements were poor and under stocked. Both herself and her husband had to teach at the Sorbonne to earn income (Marie did private tutoring at night and researched during the day).

In 1896 Henri Becquerel, a French physicist, discovered radioactivity. This discovery inspired the Curies in to further experiment with radioactivity, which led to the isolation of two elements: radium and polonium, (named after Poland, the country of Marie's birth). Marie Curie developed methods for the separation of radium from radioactive residues in large quantities. Madame Curie also studied many of its properties including therapeutic properties, such as cancer treatment. In 1903, Marie and Pierre Curie, as well as Henri Becquerel were awarded the Nobel Prize.

Sadly, her husband Pierre died in a tragic accident, 1906, after which she immediately took his place as Professor of General Physics- making her the first woman to hold the position of Professor at the University. Throughout her life Curie promoted the use of radium to alleviate suffering. Marie and her daughter, Irene (who also won a Nobel Prize) worked together during World War I to help promote radium. Through the effort of Marie and her colleagues, the University of Paris opened the Radium Institute's Curie Laboratory, which Marie Curie became the director of in the year 1914.
Marie retained her enthusiasm for science throughout her life and did much to establish a radioactivity laboratory in her native city of Warsaw. In 1929 President Hoover of the United States presented her with a gift of $ 50,000, donated by American friends of science, to purchase radium for use in the laboratory in Warsaw.

Curium, element 96, is named in honor of Marie Curie. Francium, element 87, is named for France, site of the Curie Institute where it was discovered. Marie died at the age of 66 on July 4th, 1934 in Paris.

CHARLES DARWIN was born in Shrewsbury, England on Feb. 12th, 1809. The son of a doctor, Dr. Robert Darwin, Charles was born into a modestly wealthy family. Charles' mother died in 1817 when he was eight years old. Throughout his childhood, Charles was interested in animals, horse riding and hunting. He had a fondness for biology.

In 1828 Charles went to Cambridge to study theology. There, Charles developed a friendship with a professor of botany, John Henslow, with whom he enjoyed discussing the natural world. In 1831, Charles received his Bachelor of Arts degree from Cambridge.

His Majesty's Ship, the *HMS Beagle* was soon to leave on a two year, around the world voyage. Its mission was to map the coast of South America. The ship's captain, Robert Fitzroy, wanted a naturalist to accompany him on the voyage. Henslow had recommended Darwin as "qualified for collecting, observing and noting anything worthy." Darwin decided to join the crew because he wanted to expand his research as a naturalist.

HMS Beagle reached the Galápagos Islands on September 17th 1835. On the Galápagos, he found many fossils of extinct organisms. He also saw giant tortoises whose shells varied from island to island. After a while, Darwin noticed that there were two varieties of iguanas on the island, one species adapted for sea and one for land. He noticed over twenty species of finches, each with a different beak, suited for its native island. Darwin began to think that perhaps species could change to suit their environment.

In 1842 Darwin wrote a thirty five-page essay on his idea, though he kept it a great secret. In 1844 he increased it to two hundred and thirty pages, still a secret. He did not publish his results due to the impact of religion his findings may have. However, in 1848 the book "Vestiges of Natural History and Creation" by Robert Chambers was published anonymously. This book, suggesting species could change, caused a great scandal and many claimed it was lacking in clear, scientific evidence. Charles decided that using his knowledge from the Voyage of the Beagle, he could support his claims and theories of natural selection.

Darwin worked long and hard on his book until he received a letter from a younger friend, Alfred Wallace. Wallace had sent Darwin an essay outlining his theory of evolution, strikingly similar to Darwin's. Also, the Captain of the Beagle, Caption Fitzroy, had published his findings. These circumstances may have lead Darwin to finally publish his findings.

On November 24th, 1859, Darwin's book was finally published. *The Origin of the Species* was five hundred pages long, and sold its initial print run of 1250 copies in one day. Darwin's book was incredibly successful, and, although receiving at the time much criticism, is the basis of today's evolutionary theories

Darwin died in 1882, and never lived to see how much impact his findings would have on the scientific world. At the time of his studies, his findings mostly had an impact on religion. It was not for another fifty years that his findings would have an impact on biology.

Students can have fun being creative in science class while learning about different scientists!

PLAN "C": NUTRITION LABELS AND ORGANIC COMPOUNDS

How May I Take Your Order?

- Students learn about fats, carbs, and proteins, and how the numbers add up on nutrition labels.

Name: _____ Date: _____

HOW MAY I TAKE YOUR ORDER?



Have you ever looked a nutrition label? What type of information can you find? Does this information mean anything to you? Why do you think nutrition labels exist?

Food regulation has been known to occur as early as the 13th century when the King of England prohibited bread makers from adding ground peas into the dough. In America, it began as early as colonization; years later President Lincoln launched the Department of Agriculture and Bureau of Chemistry (which we know now as the F.D.A., Food and Drug Administration).

In 1990, the *Nutrition Labeling and Education Act (NLEA)* was passed. This act requires all packaged foods to have nutrition labeling and all health claims for foods to be consistent with certain terms defined by the Secretary of Health and Human Services. The food ingredient panel, serving sizes, and terms such as "low fat" and "light" are standardized. This has evolved into the nutrition label as we know it today.

Just a year later in 1991, nutrition facts, which include basic per-serving nutritional information, are required on foods under the Nutrition Labeling and Education Act of 1990. Food labels are to list the most important nutrients in an easy-to-follow format.

1. Describe one of the earliest recorded food regulations: _____

2. Which two federal agencies did President Lincoln introduce?

3. What does the NLEA stand for? When was it passed, and how does it affect consumers?

The three main items you will see listed on nutrition labels are fats, carbohydrates, and proteins. Each of these is different in structure and function, but they are similar in one way, that your body needs them to survive.

FATS

Our body needs fat for many things, including heat and padding to help protect our vital organs. But fat is also important for things on a more microscopic scale such as endocrine function and absorption of essential vitamins. Fat is made up triglycerides and fatty acid chains, which are comprised of carbon, hydrogen, and oxygen.

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Fats can be saturated or unsaturated. Saturated fats are solid at room temperature, and have as many hydrogen atoms as they can carry (in other words they are "saturated" with hydrogen atoms). Examples of saturated fats are fats found in butter, animal fat, ice cream, and whole milk.

Unsaturated fats have less hydrogen atoms in their structure than saturated fats. This is because some of the carbon atoms in their structure create double bonds. Unsaturated fats are liquid at room temperature. Examples include most vegetable oils, fish oil, and most fats found in nuts. There are two categories of unsaturated fats: monounsaturated and polyunsaturated. The structural difference is that monounsaturated fats have one double bond between carbon atoms, and polyunsaturated fats have more than one double bond. Typically, unsaturated fats are best for your health because they actually improve good cholesterol and decrease bad cholesterol.

Though your body does need fat to survive, having too much fat in your diet poses many health threats, including high cholesterol, which can lead to stroke and heart attack. The cholesterol can build up in your arteries and eventually clog them, causing blood flow to significantly slow down to the brain and other parts of the body.

4. Why does the body need fats? _____

5. Which three types of elements make up fats? _____

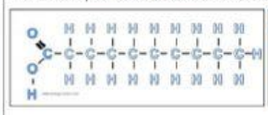
6. Give four examples of saturated fats: _____

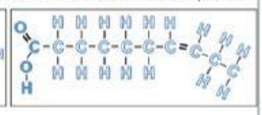
7. Give two examples of unsaturated fats: _____

8. What is the difference between monounsaturated fats and polyunsaturated fats?

9. Explain what could happen to your body if you consumed too much fat.

10. For each picture below, label it as "saturated fat" or "unsaturated fat" in the line provided.





_____ _____

11. Is the unsaturated fat pictured monounsaturated or polyunsaturated? _____

CARBOHYDRATES

Carbohydrates (or "carbs") are also composed of carbon, oxygen and hydrogen atoms, but they are very different in design and function compared to fats. Carbohydrates are what the body uses first for energy. Examples of carbohydrates included glucose, fructose, sucrose, and starches. Carbohydrates are sugars. Carbohydrates cannot be stored for very long, and are converted into glycogen in the liver. Any excess glycogen is stored as fat. You may have heard of "blood sugar", this refers to your glucose levels. Your brain cannot use fat as energy directly; it needs glucose- hence why when your blood sugar is low, you tend to feel dizzy and unable to concentrate. But, don't worry- your body has a way to convert fats into a usable form for the brain as a last resort. Carbohydrates are also required for cell function among all living things.

Carbohydrates are found in many things. Plants use them for structural support in a form called cellulose. Cellulose appears on nutrition labels as "fiber". We are not able to digest cellulose, but it aids in smooth digestion of the intestines.

12. Give 3 examples of carbohydrates listed in the reading:

13. What does the liver convert excess carbohydrates into? _____

14. Explain why low blood sugar leaves you feeling dizzy: _____

15. What is cellulose? _____

The theory behind low-carb or no-carb diets is that by eliminating carbohydrates completely, your body will directly use its stored fats, thus a quicker way to burn excess fat. This theory has not been proven, as there are many factors involved, and the body is a complex machine.



PROTEINS

Proteins are not particularly useful for energy- but our bodies do need them to build and repair muscle tissue. Proteins are broken down into smaller molecules called amino acids. Our bodies do not have a way to store proteins, they just sort of hang around until they are needed. Foods that are highest in proteins include meats, eggs, nuts, cheese, yogurt, and other types of dairy. Proteins are also important for cell function.

16. Name 2 reasons our bodies require proteins: _____

17. Name 4 types of foods high in protein. _____

CALORIES

Most of us think of calories as being related to food, but calories can be found in just about anything containing energy. As we know our body needs to energy to survive- it needs energy to do anything at all! Let's say your breakfast this morning was 250 calories, your body takes these calories and breaks them down through metabolic processes. These metabolic processes break down the carbohydrates, fats, and proteins and send them through the blood stream to cells, or continue on with the metabolic process to react with oxygen to release energy.
To simplify things, Carbohydrates, Fats, and Protein, are the actual energy when broken down by our body. Every carbohydrate, fat and protein has its own amount of energy, or calories. See the table below:

Type of organic molecule	Amount of calories per gram
Fat	9
Carbohydrates	4
Protein	4

Example- If you ate a meal that had 4g of fat, 16g of Carbs, and 11g of protein, it would be 144 calories (4g Fat x 9cal/g=36 + 16g Carbs x 4cal/g= 64 calories + calories + 11g Protein x 4cal/g= 44 calories= 36 + 64 + 44 calories= 144 calories).

	Number of grams	Multiply # of grams by...	Total
Fats	4	9 calories	36
Carbs	16	4 calories	64
Protein	11	4 calories	44
		Total calories:	144

Use the information above to help you fill in the tables below:

18.	Number of grams	Multiply # of grams by...	Total
Fats	14	9 calories	
Carbs	22	4 calories	
Protein	10	4 calories	
		Total calories:	

Try this one (solve for the grams of carbs).

19.	Number of grams	Multiply # of grams by...	Total
Fats	8	9	
Carbs	?	4	
Protein	19	4	
		Total calories:	220

Reading a Nutrition Label- When reading a nutrition label, there are some key factors you want to look out for: serving size (as well as serving size per container) calories, total fat, carbohydrates, and proteins, and percent daily value.

Nutrition Facts
Serving Size 1/2 cup (115g)
Servings Per Container About 4

Amount Per Serving	
Calories 250	**Calories from Fat** 130
	% Daily Value*
Total Fat 14g	**22%**
Saturated Fat 9g	**45%**
Cholesterol 55mg	**18%**
Sodium 75mg	**3%**
Total Carbohydrate 26g	**9%**
Dietary Fiber 0g	**0%**
Sugars 26g	
Protein 4g	
Vitamin A 10%	Vitamin C 0%
Calcium 10%	Iron 0%

* Percent Daily Values are based on a 2,000 calorie diet

20. How many TOTAL calories are in this particular food? (Hint: multiply calories by total servings per container): _____

21. Is this nutrition label for a fruit or vegetable, or any type of plant? How do you know? _____

22. *Notice that decimals are not used on nutrition labels.* The total number of Calories from Fat is listed as 130. You know how the total fat calories are calculated. Review the nutrition label. Is the Total Fat listed higher, lower, or the same as the actual total fat, based on the total calories from fat? _____

MATCHING GAME

Try to match the nutrition labels pictured with the following by matching the letters to each numbered term.

1) _____ 1 egg 2) _____ 1 Big Mac® 3) _____ 1 tomato 4) _____ 1 cup nonfat yogurt

Nutrition Facts A
Serving Size (240g)

Amount Per Serving	
Calories 243	Calories from Fat 20
	% Daily Value*
Total Fat 2.80 g	4%
Saturated Fat 1.80 g	9%
Trans Fat	
Cholesterol 12.25 mg	4%
Sodium 109.86 mg	5%
Potassium 499.65 mg	13%
Total Carbohydrate 45.67 g	15%
Dietary Fiber 0 g	0%
Sugars 45.67 g	
Sugar Alcohols	
Protein 9.75 g	
Vitamin A 98 IU	2%
Vitamin C 1.47 mg	2%
Calcium 338.1 mg	34%
Iron 0.35 mg	1%

Nutrition Facts B
Serving Size (50g)

Amount Per Serving	
Calories 70	Calories from Fat 40
	% Daily Value*
Total Fat 4.5g	**7%**
Sat. Fat 1.5g	**8%**
Trans Fat 0g	
Cholest. 215mg	**71%**
Sodium 65mg	**3%**
Total Carb. Less than 1g	**0%**
Protein 6g	**10%**
Vitamin A 6% • Vitamin C 0%	
Calcium 2% • Iron 4%	

Nutrition Facts C
Serving Size 1 serving (219g)

Amount Per Serving	
Calories 572	Calories from Fat 270
	% Daily Value*
Total Fat 31g	48%
Saturated Fat 11g	55%
Cholesterol 79mg	26%
Sodium 1052mg	44%
Total Carbohydrate 47g	16%
Dietary Fiber 3g	12%
Sugars	
Protein 26g	
Vitamin A 0% • Vitamin C 1%	
Calcium 28% • Iron 17%	

Nutrition Facts D
Serving Size (212.0 g)

Amount Per Serving	
Calories 10	Calories from Fat 5
	% Daily Value*
Total Fat 0.6g	**1%**
Saturated Fat 0.1g	**0%**
Polyunsaturated Fat 0.2g	
Monounsaturated Fat 0.1g	
Cholesterol 0mg	**0%**
Sodium 89mg	**2%**
Total Carbohydrates 6.3g	**2%**
Dietary Fiber 1.5g	**6%**
Protein 2.1g	
Vitamin A 6% • Vitamin C 32%	
Calcium 2% • Iron 6%	

Name: _____ Date: _____

HOW MAY I TAKE YOUR ORDER?



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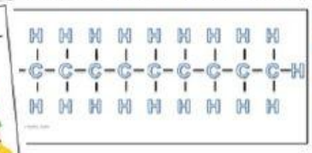
3. What does the NLEA stand for? When was it passed, and how does it affect consumers? _____

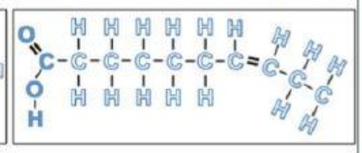
The three main items you will see listed on nutrition labels are fats, carbohydrates, and proteins. Each of these is different in structure and function, but they are similar in one way, that your body needs them to survive.

FATS

Our body needs fat for many things, including heat and padding to help protect our vital [illegible] on a more microscopic scale such as endocrine [illegible] Fat is made up triglycerides and fatty acid

10. For each picture below, label it as "saturated fat" or "unsaturated fat" in the line provided.





_____ _____

unsaturated fat pictured monounsaturated or polyunsaturated? _____

'DRATES

'ates (or "carbs") are also composed of carbon, oxygen and hydrogen atoms, but they fferent in design and function compared to fats. Carbohydrates are what the body uses rgy. Examples of carbohydrates included glucose, fructose, sucrose, and starches. ates are sugars. Carbohydrates cannot be stored for very long, and are converted into the liver. Any excess glycogen is stored as fat. You may have heard of "blood sugar", your glucose levels. Your brain cannot use fat as energy directly; it needs glucose- when your blood sugar is low, you tend to feel dizzy and unable to concentrate. But, your body has a way to convert fats into a usable form for the brain as a last resort. es are also required for cell function among all living things.

es are found in many things. Plants use them for structural support in a form called llulose appears on nutrition labels as "fiber". We are not able to digest cellulose, but oth digestion of the intestines.

mples of carbohydrates listed in the reading: _____

the liver convert excess carbohydrates into? _____

low blood sugar leaves you feeling dizzy: _____

ose? _____

d low-carb or no-carb diets is that by eliminating mpletely, your body will directly use its stored fats, thus burn excess fat. This theory has not been proven, as ctors involved, and the body is a complex machine.



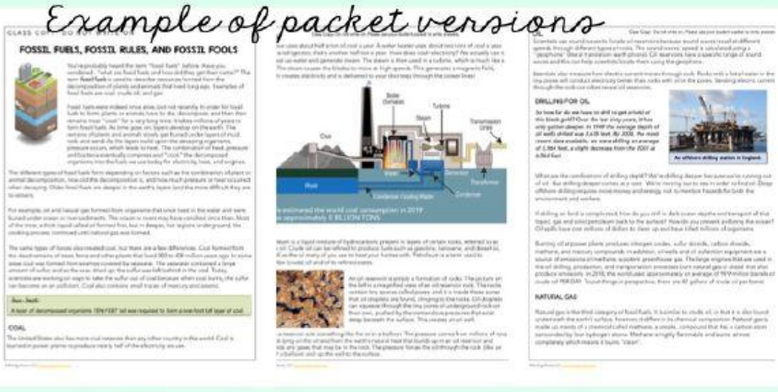
6 pages total (6th page is optional- can be reduced to 5 pages)

Students will leave the class knowing how to read a nutrition label and will be able to tell you why we have nutrition labels!

They will also have a basic understanding of carbohydrates, proteins, and fats.

ANSWER KEY AND CLASS PACKET VERSION INCLUDED

Example of packet versions



Classroom set (print once)



Student answer sheets

PLAN "D": THE EFFECT OF VIDEO GAMES ON YOUR BRAIN

The Effects of Video Games on Your Brain

Based on results in Daphne Bavelier's lab. This activity enforces that games can improve vision and attention if played in reasonable doses. Includes reading, coloring and graphing.



Name: _____ Date: _____

THE EFFECT OF VIDEO GAMES ON YOUR BRAIN

The fact is, 90% of school aged children play video games, but did you know that the age of the average gamer today is 34 years old? Video games are found in nearly all households; in fact after the one-month release of popular video games, there is an average of 68,000 years worth of game time played within homes across the U.S. It looks like they are here to stay.

First and foremost, video games are not good for your health. But, they are not necessarily bad for your health in *reasonable doses*. A reasonable dose is game time played anywhere from 5-15 hours a week.

1. What is the average age of a gamer these days? _____
2. What is considered a "reasonable dose" of video games? _____

If you play action games within the 5-15 hours weekly range, the effect of video games on your brain can actually be positive. First of all, it can help to improve your vision in a number of ways. It has been proven in a laboratory setting that action gamers are better able to resolve small detail in the context of clutter. In addition, action gamers can differentiate between different levels of gray. The eyes working to coordinate with the brain lead to overall better vision. Video games that contain high levels of action, such as Unreal Tournament, can actually improve your vision. Researchers at the University of Rochester have shown that people who played action video games for a couple hours a day over the course of a month improved by about 20 percent in their ability to identify letters presented in clutter—a visual test similar to ones used in eye clinics. In essence, playing video game improves your bottom line on a standard eye chart.

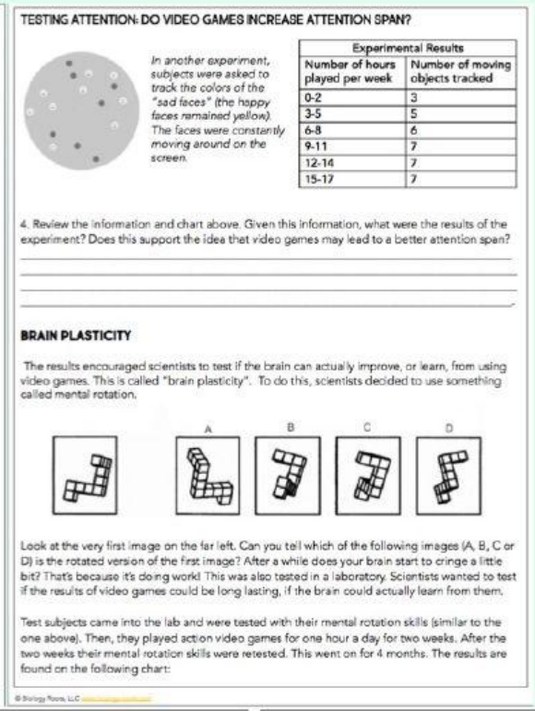
3. Describe ways in which your vision can improve from playing action video games:

_____
_____
_____
_____

D S R K N
C K Z O H
O N R K D
K Z V D C
V S H Z O
H D K O R

Average non-action gamer vision

Average action gamer vision



TESTING ATTENTION: DO VIDEO GAMES INCREASE ATTENTION SPAN?

In another experiment, subjects were asked to track the colors of the "sad faces" (the happy faces remained yellow). The faces were constantly moving around on the screen.

Experimental Results	
Number of hours played per week	Number of moving objects tracked
0-2	3
3-5	5
6-8	6
9-11	7
12-14	7
15-17	7

4. Review the information and chart above. Given this information, what were the results of the experiment? Does this support the idea that video games may lead to a better attention span?

_____
_____
_____
_____

BRAIN PLASTICITY

The results encouraged scientists to test if the brain can actually improve, or learn, from using video games. This is called "brain plasticity". To do this, scientists decided to use something called mental rotation.

Look at the very first image on the far left. Can you tell which of the following images (A, B, C or D) is the rotated version of the first image? After a while does your brain start to cringe a little bit? That's because it's doing work! This was also tested in a laboratory. Scientists wanted to test if the results of video games could be long lasting, if the brain could actually learn from them.

Test subjects came into the lab and were tested with their mental rotation skills (similar to the one above). Then, they played action video games for one hour a day for two weeks. After the two weeks their mental rotation skills were retested. This went on for 4 months. The results are found on the following chart:

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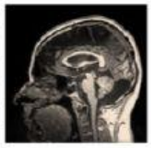
Week	Number of Correct Tries (Mental Rotation)
0	1
2	2
4	4
6	7
8	11
10	16

DIRECTIONS: Review the information in the chart. Using the template below, create a line graph (time as the x-axis; number of correct tries as the y-axis) to depict the results. Remember to title your graph appropriately!

GRAPH TITLE: _____

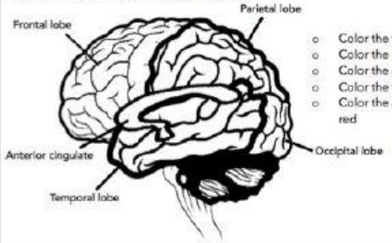
Let's look at how the brain works while playing video games, using brain imagery. First, review what the colors mean (refer to these as necessary):

Color	Indication
Red	The most active area(s) of the brain
Orange	Active
Yellow	Somewhat active
Green	Mostly inactive
Blue	Inactive
Red	The most active area(s) of the brain



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GENERAL BRAIN IMAGE DURING TETRIS



- Color the frontal lobe red
- Color the parietal lobe orange
- Color the occipital lobe green
- Color the temporal lobe blue
- Color the anterior cingulated red

Brain Part	Function
Frontal lobe	Associated with reasoning, planning, maintaining attention, and problem solving
Parietal lobe	Associated with movement, orientation, recognition, perception of stimuli, and orienting attention
Occipital lobe	Associated with visual processing
Temporal lobe	Associated with perception and recognition of auditory stimuli, memory, and speech
Anterior cingulate	Associated with award-anticipation, decision-making, and controlling/regulating attention.

5. What are the most active parts of the brain during gaming?

_____

6. What are the least active parts of the brain during gaming?

_____

7. Using the table above, explain how brain imagery achieved in the lab (similar to the one you have just created) suggests that gaming can improve attention:

_____
_____
_____

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THE NEGATIVE EFFECTS OF VIDEO GAMES

The studies above were all tested with subjects who played 5-15 hours a week, the "reasonable dose" of video games. However, devoting time to more than 15-20 hours a week of video games, puts health at risk. Here's how:

- Weight gain- not being active enough (also, poor circulation and sleep deprivation can contribute to weight gain).
- Poor circulation- sitting too much without stretching or moving can lead to poor circulation
- Sleep depravation- not having enough energy throughout the day.
- Spine and neck problems- sitting for long periods of time can lead to poor posture. You may not be worried about it now, but poor posture can have severe and permanent affects on your neck and spine. It can also lead to kyphosis (hunchback).
- Isolation- in severe cases, gamers do not get enough "face time" or social interaction with friends. This can lead to depression if for any reason they had to part with their video games and gaming network. This may lead to obsession.

There is much debate as to whether or not video games should be banned from young people, because of many reasons including childhood obesity, and that violent video games could cause violence in real life. Then, there are others, including many scientists that think video games can be good for learning, but in moderation and without extreme violence. No person claims that lots of game time is good for you. Nor do people claim that violent video games are optimal. How do I feel about video games? What is one solution I can offer?

What is your stance? Do you think that video games should be banned? Yes or no? Suggest reasons for your decision. Also, provide a compromise, or a solution, that would make both sides of the debate satisfied.

_____
_____
_____
_____
_____
_____
_____
_____

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Name: _____ Date: _____

THE EFFECT OF VIDEO GAMES ON YOUR BRAIN

The fact is, 90% of school aged children play video games, but did you know that the age of the average gamer today is 34 years old? Video games are found in nearly all households; in fact after the one-month release of popular video games, there is an average of 68,000 years worth of game time played within homes across the U.S. It looks like they are here to stay.



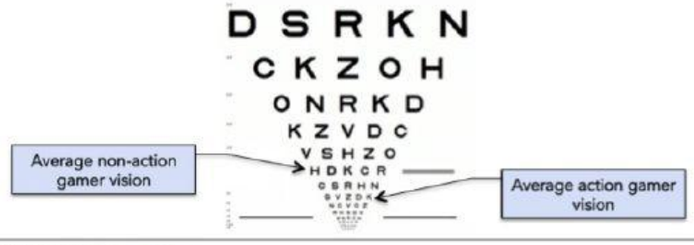
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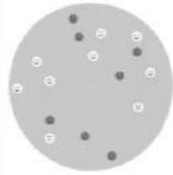
3. Describe ways in which your vision can improve from playing action video games:

_____
_____
_____
_____.



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TESTING ATTENTION: DO VIDEO GAMES INCREASE ATTENTION SPAN?



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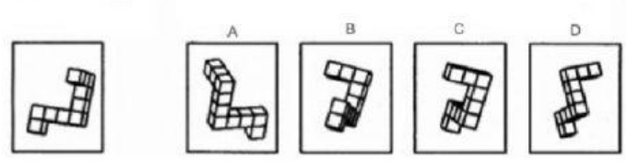
Experimental Results	
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4. Review the information and chart above. Given this information, what were the results of the experiment? Does this support the idea that video games may lead to a better attention span?

_____
_____
_____
_____.

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The results encouraged scientists to test if the brain can actually improve, or learn, from using video games. This is called "brain plasticity". To do this, scientists decided to use something called mental rotation.



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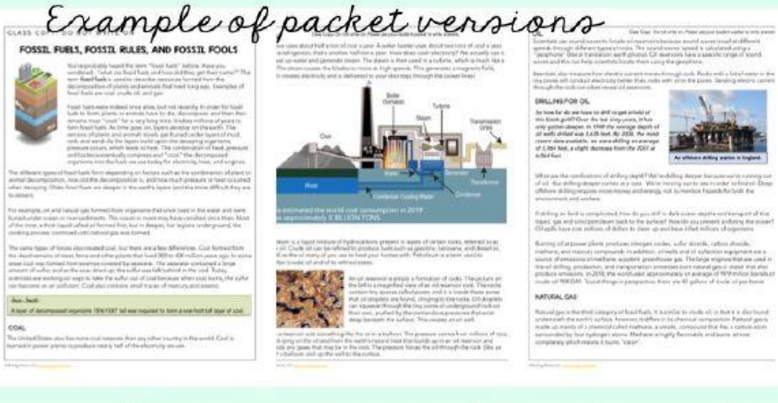
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5 pages- fifth page is optional (can be reduced to 4 pages)

This is a fun one! Students get to analyze diagrams, color parts of the brain, and do a short graphing segment.

ANSWER KEY AND CLASS PACKET VERSION INCLUDED

Example of packet versions



Classroom set (print once)



Student answer sheets

PLAN "E": HEAD, SHOULDERS, KNEES AND X-RAYS

Head, Shoulders, Knees and X-rays

Explores common sports injuries. What is a fracture? What is a sprain? What is a strain? What causes swelling and bruising? Bar graph: Common Injuries Among Sports (8 common injuries found among 4 different sports).

Name: _____ Date: _____

HEAD, SHOULDERS, KNEES AND X-RAYS

Have you ever noticed how the most high impact sports, such as football, require the most protection? High impact sports are putting bodies at more risk for injury.

Your body does have some natural protection. This includes fat, which lines the muscle and organs to provide some cushion and shock absorption. Your bones are also built to absorb some shock. Review the image below:



Your bones are made up of compact bone and spongy bone. As you can see, compact bone is the outer layer of bone, and the inner bone is called spongy bone. Though it looks like a sponge, spongy bone is actually not soft and squishy, but it is not hard as compact bones. Spongy bone is where blood vessels and bone marrow are found. Notice that cartilage lines the ends of the bones. Cartilage is primarily responsible for shock absorption between bones. Bones can withstand a lot of pressure; in fact, your femur can withstand 1200 pounds of force per square inch (think of a steel rod!)

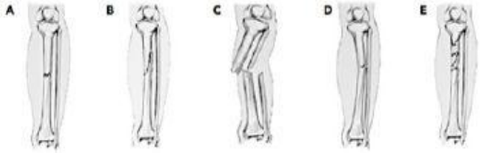
1. How does our body provide natural protection against injury?

2. What is the difference between compact and spongy bone?

Though bones do offer some support, they will crack under pressure. You have heard the term "fracture" before. Many students believe that bones are either fractured or broken- but really, the terms mean the same thing! There are actually many different types of fractures, as listed below:

Type of Fracture	Description
Greenstick	An incomplete fracture where the bone is slightly bent (hence "greenstick" [flexible]); occurs most often in children.
Spiral	A fracture that wraps around the bone in a looped or curved fashion.
Comminuted	A fracture in which the break breaks into several fragments.
Transverse	A bone that occurs at a right angle to the bone's axis (or in other words it breaks clean across the bone).
Compound	This is a very serious fracture in which the bone breaks in half and separates. This fracture is most at risk breaking through the skin and leading to infection.

3. Use the table below to try to match each picture to the description by labeling pictures A-E as either greenstick, spiral, comminuted, transverse or compound.



Bones are connected to each other with structures called ligaments. For example, your patella (knee cap) is connected to your femur and tibia by three different ligaments: the anterior cruciate ligament (or ACL), the posterior cruciate ligament (PCL) and the medial cruciate ligament (MCL).

A sprain occurs when the ligaments are compromised. Sprains can range from an overstretched ligament, which causes some discomfort, to a partial tear, which can lead to swelling and brushing, or a complete tear in which normally requires surgery.

The ACL is a ligament that runs towards the front of the knee between the femur and tibia, and

4. What are ligaments? _____

5. What is a sprain? _____

6. Where is the ACL found and why is it a common sprain in sports?

Tendons are like ligaments, except they connect bones to muscle. Using your dominant hand, look at its palm with your hand outstretched. Looking at your wrist and forearm, wiggle your thumb back and forth. Do you see anything moving down there? That's a tendon! These are known as flexor tendons.

If a tendon is compromised, either pulled or twisted, it can lead to a strain. The muscle itself being twisted or pulled can also cause strains. Contact sports such as soccer, football, hockey, boxing, and wrestling put people at risk for strains. Gymnastics, tennis, rowing, golf, and other sports that require extensive gripping can increase the risk of hand and forearm strains. Just like sprains, strains can range from mild to severe.



One of the most common strains is something called plantar fasciitis. This is a tendon that runs up and down the arch of the foot. Running and sprinting can cause excessive pulling on the plantar fasciitis, straining the tendon.

Another common type of strain you may have heard of is "tennis elbow", which seems to be specific to tennis players. This is the overstretching of the muscles and tendons at the elbow. It is usually caused by poor form, but not always.

7. What is a tendon? _____

8. What is a strain and what are two causes of strains? _____

9. What are two examples of common strains in sports? _____

Broken bones, muscle tears, as well as ligament and tendon tears near a joint can lead to swelling. This is why an ankle may appear to be three times bigger than its normal size after spraining it. Fluid build up and swelling is actually your body trying to help you. Inflammation and swelling make joints stiff, which can help immobilize them and prevent further movement that may cause further damage. The surrounding fluids can help create an environment suitable for healing damaged tissue. As the sprain heals, the swelling goes down.



Swelling can also occur at muscle tears. After a workout you may be sore for 1-5 days post workout. The reason for this muscle soreness is typically due to tearing the delicate muscle fibers, which, as you now know, is known as a strain. Not only can swelling, occur, but bruising, as well!

11. Why do joints sometimes swell after an injury? _____

12. What causes muscle soreness days after a heavy workout?

Bruising can also accompany broken points, strains and sprains. If impacted hard enough, the body's delicate soft tissue can be injured. This may cause blood vessels (veins, arteries, and capillaries) under the skin to tear. Don't worry; your body is able to repair the broken blood vessels so that you don't bleed forever. But, some of the red blood cells might seep into the layers of your skin. This is what causes the bluish color of bruises. As the red blood cells are naturally broken down and removed by the body, the bruise changes colors and gradually disappears.

13. What causes a bruise to occur? _____

14. What causes a bruise to appear bluish in color?

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GRAPH: MOST COMMON SPORTS INJURIES

Directions: For this particular graph you will be creating a bar graph using the chart below. You will need 4 different colors. Look at the chart to determine which colors you will need! Be sure to label your axes (y axis= percentage of total injuries; x axis= type of injury). Please make a key on the graph to indicate which sport is which color. Please note that we will not be graphing all the sports injuries that take place in that sport, only the most common ones throughout 4 different sports.

Type of Injury	Football (blue)	Baseball (red)	Gymnastics (green)	Basketball (purple)
Fractures	10%	1%	2%	1%
ACL Sprain	5%	6%	10%	15%
Plantar fasciitis strain	20%	15%	6%	12%
Ankle Sprain	25%	20%	20%	20%
Quad Strain	10%	20%	10%	19%
Hamstring Pull (Strain)	15%	22%	12%	18%
Lower Back Pain	10%	10%	20%	9%
Achilles strain	5%	6%	20%	6%

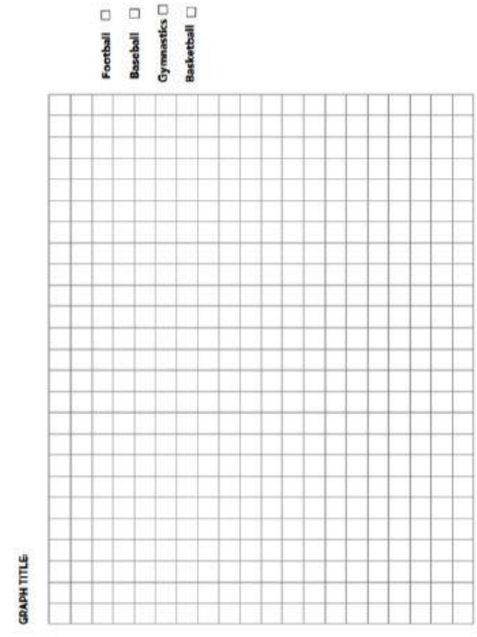
ANALYSIS QUESTIONS (answer after completing graph):

15. Of the 8 most common sports injuries, which one is the most common?

16. Of the 8 most common sports injuries, which one is the least common?

17. What is the most common injury in football? In gymnastics?

18. Which sport is most likely to cause ACL sprains?



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6 pages including 2 pages of graphing (directions and grid). **Can be reduced to 4 pages** (graphing is optional).

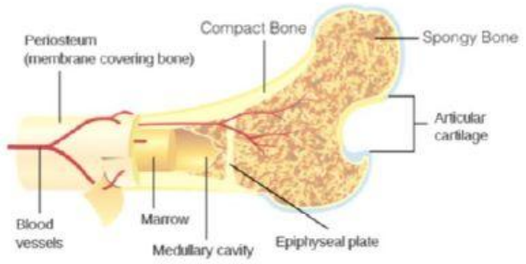
ANSWER KEY AND CLASS PACKET VERSION INCLUDED

Name: _____ Date: _____

HEAD, SHOULDERS, KNEES AND X-RAYS

Have you ever noticed how the most high impact sports, such as football, require the most protection? High impact sports are putting bodies at more risk for injury.

Your body does have some natural protection. This includes fat, which lines the muscle and organs to provide some cushion and shock absorption. Your bones are also built to absorb some shock. Review the image below:



Your bones are made up of compact bone and spongy bone. As you can see, compact bone is the outer layer of bone, and the inner bone is called spongy bone. Though it looks like a sponge, spongy bone is actually not soft and squishy, but it is not hard as compact bones. Spongy bone is where blood vessels and bone marrow are found. Notice that cartilage lines the ends of the bones. Cartilage is primarily responsible for shock absorption between bones. Bones can withstand a lot of pressure; in fact, your femur can withstand 1200 pounds of force per square inch (think of a steel rod!)

1. How does our body provide natural protection against injury?

_____
_____
_____.

2. What is the difference between compact and spongy bone?

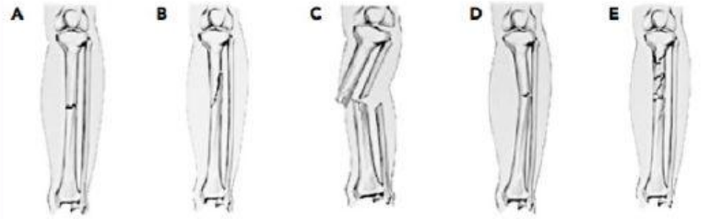
_____
_____
_____.

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Type of Fracture	Description
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_____ _____ _____ _____ _____

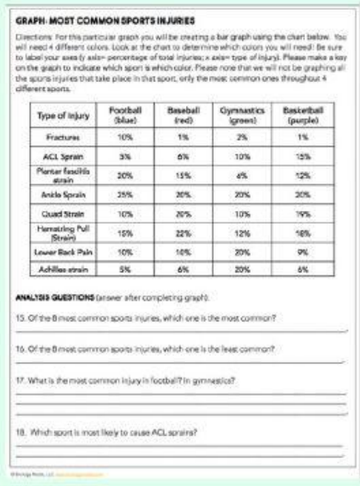
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A sprain occurs when the ligaments are compromised. Sprains can range from an overstretched ligament, which causes some discomfort, to a partial tear, which can lead to swelling and brushing, or a complete tear in which normally requires surgery.

The ACL is a ligament that runs towards the front of the knee between the femur and tibia, and is one of the most common sprains in sports history; it often needs surgery to repair. Most ACL strains can be linked to stopping suddenly, like trying to stop suddenly and cut in another direction, or from hyperextension of the knee, or pivoting in place. Several sports regularly bring sources of stress like this down on the ACL.

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OPTIONAL GRAPHING EXERCISE FOR EXTRA PRACTICE OR LONGER CLASSES.



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Achilles strain	5%	6%	20%	6%

ANALYSIS QUESTIONS (answer after completing graph):

15. Of the 8 most common sports injuries, which one is the most common?

16. Of the 8 most common sports injuries, which one is the least common?

17. What is the most common injury in football? In gymnastics?

18. Which sport is most likely to cause ACL sprains?

