Summer 2020
Enrichment Packet

For Students Entering

Environmental Science
School Year 2020-2019

Summer 2020 Enrichment Packet for Students Entering Environmental Science - School Year 2020-2019

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Welcome & Course Introduction:

Environmental Science is the study of the natural world; discovering how and why organisms and the environment are interconnected. Topics and material learned in previous classes will be revisited—specifically algebra, biology, chemistry, and even secondary social studies. Lesson progression is fast paced during the year, so possessing a complete understanding of these topics will help you immensely. In terms of math, you need to be comfortable with four topics: metric prefixes, dimensional analysis/factor label, calculations with scientific notation and percent change. Included in this packet are links to online resources and practice problems.

This packet is a review of geography and science topics including map components such as continents, countries, and specific locations within those countries and concepts from matter & energy, Biology, and Chemistry. Acronyms will be used when identifying and discussing different agencies and organizations within this lesson. All this information has been included within this packet. Monday of every week should be the start of a new section. All packets must be completed by or before the second week of the fall semester. During the second week of the fall semester (once we've settled down to a regular schedule), all packets will be collected. Please enjoy the summer in the best ways you know how and we will see each other in fall.

Directions:

Please carefully read this cover page in its entirety. The summer packet assignment is worth 10% of your grade for the first quarter. You will also take a benchmark on this content by the end of the third week. Please print this packet and submit to Dr. Clarke during the first two week of school. You may also download the document make a copy; put your name on it,

"Environmental Science Summer Enrichment Packet 2020 **YOUR NAME**
and then, share the document to Dr. Clarke by the first two week when school opens.

Watch all videos (links are provided) in order for you to understand the materials. You will surely enjoy this class because we have lots of hands on exercise and show/program at the end of the year for our parents and the community. Late work will not be accepted because course pacing is extremely fast. If you develop a pattern of completing work late you WILL fall behind.

Calendar:

Week 1	June 22-26	Lorax: Environmental issues research project
Week 2	June 29 - July 3	MATH Refresher - Scientific Notation
Week 3	July 6 – 10	Graphing /Dimensional Analysis/Percent Change
Week 4	July 13 – 17	PREFIXES AND CONVERSIONS (Review on Chemistry)
Week 5	July 20 – 24	EARTHECHO Expeditions What's the Catch?
Week 6	July 27 – 31	GEOGRAPHY
Week 7	August 3 -7	Physical science Review
Week 8	August 10-14	Life Science Review
Week 9	August 17-21	Weather & Climate Issues
Week 10	August 24-28	Environmental Science Literacy

I. Introduction:

Week 1	June 22-26	Lorax: Environmental issues research project

Watch the original The Lorax (1972), written by Dr. Seuss. The animated film is approximately 25 minutes long. It is available on YouTube, search for the "original Lorax."

Here is one link: https://youtu.be/8V06ZOQuo0k

As you watch the film, answer the following questions in full sentences please

1. Describe the opening scene of The Lorax.

2. What happened to the Lorax that once lived in this town?

3. What did the town first look like when the Once-ler arrived?

4. How do the Once-ler and the Lorax first meet?

5. How does the Once-ler market his "thneed?" (Hint: look at the initial sign he puts up.).

Environmental Issues Project

6. Why do more Once-lers move into the town?

7. How does the business impact the land/environment?

8. As the "thneed" industry continues to grow, the Lorax continues to speak out… what does the Lorax consistently say after he introduces himself as the Lorax?

9. After the Lorax speaks with the Once-ler about the loss of biodiversity (such as the barb-a-loots that must leave to look for food elsewhere), the Once-ler "thinks" about his business' impact on the environment. How does the Once-ler reason away his shame?

10. The Lorax and the Once-ler speak again about the swami-swans and the fish. This time the

Once-ler says he will reconsider his actions... then, what happens that makes him forget about the environmental pollution?

11. What does the Lorax leave behind (in front of the Once-ler's house)?

12. What does the Once-ler tell the boy this word (your answer to number 11) means?

13. What is the last thing the Once-ler gives to the boy?

Reflection

14. How would you characterize the story's ending? Why?

15. Why do you think the Once-ler is portrayed as he is (faceless and green)?

16. What does the made up word "thneed" mean? How is it representative of consumerism?

Relating The Lorax to the Real-World

There are many environmental topics touched upon in this short story by Dr. Seuss. Below is a list.

Pick your top three topics then continue reading for your research project instructions.

(Note: You may not know what everything is; if something sounds interesting to you, Google it!)

Topics from the Lorax:

1. Urbanization
2. Habitat destruction
3. Environmental refugees
4. Deforestation
5. Industrial smog
6. Air pollution
7. Water pollution
8. Environmental restoration
9. Tragedy of the Commons
10. Conservation
11. Loss of biodiversity
12. Environmental advocacy
13. Conspicuous consumption
14. Littering

You will create an 8-slide presentation (plus, one reference slide if necessary). Here's a break-down of what to include on your slides: (see this link as example https://docs.google.com/presentation/d/13Yhw6GpGmJVEAx9uqBjfFo6I7Cvxqko9Gi4wyk0z9K4/edit?usp=sharing

Slide #1: Your name & the three topics that you chose (See the sample slides.)

Slide #2: A definition of your first topic (summarize it in your own words) as well as an example of this issue occurring in The Lorax (you may also include a screenshot from the film). Include your sources at the bottom of the slide. (See the sample slides.)

Slide #3: A real-world example of the first topic. Use bullet points to outline the facts of this particular case. Include a picture or two (and make sure to reference it in the bullet points or provide a caption). Include your sources at the bottom of the slide. (See the sample slides.)

Slide #4: A definition of your second topic (summarize it in your own words) as well as an example of this issue occurring in The Lorax (you may also include a screenshot from the film).

Include your sources at the bottom of the slide.

Slide #5: A real-world example of the second topic. Use bullet points to outline the facts of this particular case. Include a picture or two (and make sure to reference it in the bullet points or provide a caption). Include your sources at the bottom of the slide.

Slide #6: A definition of your third topic (summarize it in your own words) as well as an example of this issue occurring in The Lorax (you may also include a screenshot from the film). Include your sources at the bottom of the slide

Slide #7: A real-world example of the third topic. Use bullet points to outline the facts of this particular case. Include a picture or two (and make sure to reference it in the bullet points or provide a caption). Include your sources at the bottom of the slide.

Slide #8: References (if your teacher instructs you to do an additional slide with citations in a specific format)

When you are done with your research presentation, go back and double check:

- Do you have a title slide with your name & chosen topics?
- Are there definitions for each topic?
- Did you summarize the definitions in your own words?
- Did you reference an example from The Lorax for each topic you chose?
- Do you have real-world examples of each topic? Did you describe the example in enough detail that someone not familiar with the story would understand what happened?
- Did you add screenshots/pictures/clipart to make your slides visually appealing?
- Are all your references cited correctly?

Review the rubric next page to ensure your project is ready for submission!

Student's Name: Per/Block: Date:

The Lorax Environmental Issues Research Project Scoring Rubric

Criteria	Exceeding (4)	Meeting (3)	Approaching (2)	Incomplete (1)
Presentation contains research slides as outlined	All slides are included; the slides are organized, thorough in their presentation and visually appealing with images/pictures and clipart.	All slides are included with the requested information; images are used to enhance the presentation.	Some slides may be missing pieces of information.	Multiple slides are missing pieces of information; or slides altogether are absent/incomplete.
Terms are properly defined	All terms are defined in the student's own words; examples may be given for clarification. It is clear the student understands these topics.	All topics are defined in the student's own words.	Some terms are defined properly; they may not be in a student's own words.	Terms are either not defined properly or definitions are copied word-for-word from another source.
Connections to *The Lorax* are made	There are more than 3 examples relating back to the story; screenshots or other images are included along with precise descriptions.	There is at least 1 example of how each topic is represented by a specific scene in the story. Screenshots may also be included.	Examples are given for some topics, maybe not all. Or the examples are not precise enough to demonstrate an understanding of the story.	Examples are too vague to demonstrate understanding or examples are missing.
Research presented is accurate & informative	Real-world examples are summarized accurately & more than 1 example may be given for a particular topic. Or, explanations go into depth.	Real-world examples are summarized accurately & show an understanding of how they relate to a specific topic.	Real world examples are present; they need more detail to demonstrate understanding.	Real-world examples are missing or missing crucial details.
References are properly cited	Multiple sources are used for research on each slide.	Sources are cited on each slide.	Most sources appear to be cited; some may not be cited correctly.	Citations are missing or not done according to instructions.

Total Score: ____/ 20 possible points

______% (out of 100 points)

Additional Comments:

Week 2	June 29 - July 3	MATH Refresher - Scientific Notation

CONVERT FROM SCIENTIFIC NOTATION:

________________ 1. 3.78 X 104

________________ 2. 4.1 X 10-3

________________ 3. 2.0 X 109

________________ 4. 8.99 X 10-7

________________ 5. 4.04 X 105

CONVERT TO SCIENTIFIC NOTATION

__________ X 10 _____ 6. .000 000 003 45

__________ X 10 _____ 7. 19,890,000

__________ X 10 _____ 8. 1,070,000

__________ X 10 _____ 9. .00056

__________ X 10 _____ 10. 45,000,000,000,000,000,000

Using your calculator, complete the following calculations.

Use the EXPONENT KEY! Write your answer in STANDARD & Scientific Notation:

_____________________ __________________ 11. 4.88 X 10-7 x 3.20 X 1012

Standard Notation Scientific Notation

_____________________ __________________ 12. 9.8 X 1012 ÷ 7.99 X 104

Standard Notation Scientific Notation

Week 3	July 6 - 10	Graphing /Dimensional Analysis/Percent Change

GRAPHING: CO_2 and Global Temperature

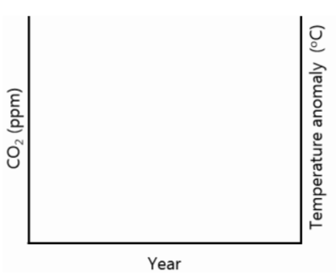
Since the Industrial Revolution in the 1800s, fossil fuels such as coal, oil and gas have been extracted from the Earth and burned for energy. When fossil fuels are combusted they produce water and the greenhouse gas carbon dioxide (CO_2) and climate scientists have concluded that there is a relationship between the levels of atmospheric CO_2 and global temperatures.

Scientists have been monitoring the quantity of CO_2 in the atmosphere (measured in parts per million of air, ppm) and the difference between the long-term average temperature and the actual temperature. This difference is known as a temperature anomaly – a positive value and it is hotter than normal; a negative value and it is cooler than normal. Using the data given, plot a graph to show the relationship between atmospheric carbon dioxide levels and global temperatures.

Year	CO_2 levels (ppm)	Temperature Anomaly (°C)
1970	325	0.0
1975	330	0.02
1980	338	0.2
1985	345	0.23
1990	354	0.34
1995	360	0.37
2000	369	0.5
2005	379	0.6
2010	389	0.62
2015	399	0.8
2020 (estimate)	412	0.91

Data from https://climate.nasa.gov

<u>Graph</u>



You are expected to complete two graphs on one piece of graph paper. As a guide the labels for the axis are given shown: What is the relationship between atmospheric CO_2 and global temperature anomaly?

Complete when you have had your graph marked

Ninety seven (97%) of climate scientists now agree that climate changes over the last 100 years are due to human activity. One of the effects of climate change is that the quantity of Arctic sea ice is changing.

Using the data in the table and example perform calculations to show how much it has decreased each decade:

Year	Sea Ice (million sq. km)	% Change
1980	7.9	NA
1990	6.3	***1.*** (7.9-6.3)/7.9 = 0.2 ***2.*** 0.2 x 100 = 20%
2000	6.4	
2010	4.9	
2015	4.6	

One method of reducing CO2 in the atmosphere is to use renewable and nuclear energy sources.Using the data below label the pie chart showing the energy source in the USA in 2017.

In 2017 80% of energy use in the USA came from the combustion of fossil fuels; 37% from petroleum, 8% less from natural gas and the remainder from coal. Of the 20% of energy that came from other sources 9% was from nuclear power and 11% from renewable sources

DIMENSIONAL ANALYSIS:

ALWAYS ALWAYS ALWAYS SHOW YOUR WORK AND INCLUDE YOUR UNITS.

1. How many millimeters are in 8 inches? Please round your answer to the nearest 10th (1 inch = 2.5 cm.)

2. If you are going 50 miles per hour, how many feet per second are you traveling (1 mile = 5280 feet; you may use 5000 as an approximation)?

PREFIXES AND CONVERSIONS (Review on Chemistry)

Week 4	July 13 - 17	PREFIXES AND CONVERSIONS (Review on Chemistry)

https://www.youtube.com/watch?v=o-PJq7PT30w&feature=youtu.be

Base unit	Prefix/ metric unit	Is it smaller than the base unit or bigger than the base unit? What is your basic relationship? Write the relationship 2 ways (as an equivalence and as a dimensional analysis conversion factor)	Write as a decimal or expanded number (as compared to the base unit)	Write in scientific notation (as compared to the base unit)
METER (m)	Centimeter (cm)		1 cm = 0.01 m	1 cm = 1 x 10^{-2} m
	Kilometer (km)			
	Millimeter (mm)			
GRAM (g)	Kilogram (kg			
WATT (W) (energy)	Kilowatt (kW)			
	Megawatt (MW)			

PERCENT CHANGE: ALWAYS ALWAYS ALWAYS SHOW YOUR WORK!

1. Calculate the percent increase in per capita world grain production between 1950 and 2000 using the data at right.

Week 5	July 20 - 24	EARTHECHO Expeditions What's the Catch?

What's the Problem with Trawling?

Activity 1:

Students analyze the catch from a marine sample from 3 different areas

1. An area which has seen a heavy amount of commercial beam trawling
2. A natural reef in a protected marine area
3. An area where small sized fishing vessels have been used

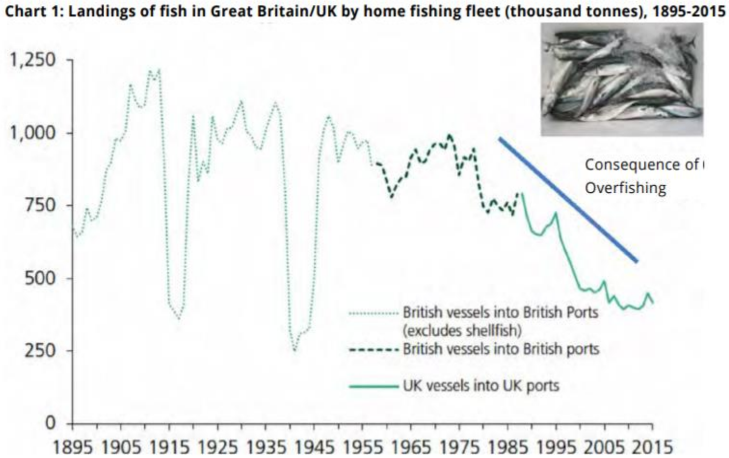
Each area is represented by a video showing the types of organisms present in that location. Students complete a table analyzing the 3 different areas for their biodiversity and marine conditions.

Students review this data and answer a longer written question regarding the information that they have gathered. A mark scheme is supplied for self-assessment.

Activity 2: Students analyze graphs regarding effects of trawling on fish stocks and answer a series of questions describing and explaining supplied graphs (see student worksheets). There is one graph that looks at the decrease of fish stocks since 1895, to 2015. The other looks at the effect of management of stocks, in particular the rise in cod numbers since 2005.

Plenary: Students look at solutions to these issues, given information regarding the effects of various sustainable and unsustainable fishing methods, they create a 5 point plan for the UK to implement into its North Sea fishing industry to prevent the current decline in biodiversity and fish stocks

Chart 1: Landings of fish in Great Britain/UK by home fishing fleet (thousand tonnes), 1895-2015



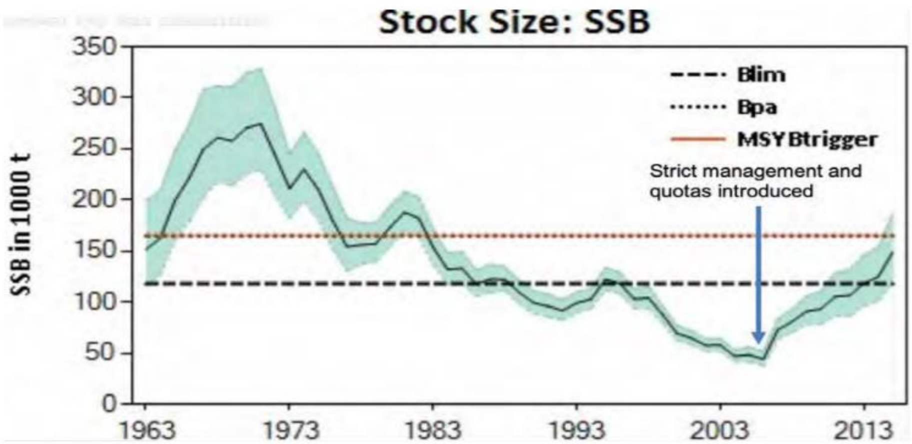
1. Describe the trend in the landings of fish from 1950 to 2010 (2 marks)

2. Why was there a large decrease in fish landings twice before 1950? (1 mark)

-

3. Explain how the use of large commercial trawling vessels may have contributed to this trend? (3 marks)

What's the Catch?



North Sea Cod

1. Describe the trend in the stock size of North sea cod from 1970 to 2005 (2 marks)

2. What is meant by a quota? (1 mark)

3. Explain, using data from the graph, the effect that introduction of fish quotas and strict management has affected North Sea Cod stocks. (3 marks)

Week 6	July 27 - 31	Lesson Title: Data Series – An Historical Record of CO2

Question: How has the concentration of atmospheric CO2 changed throughout history?

Research the following Vocabulary:

- anthropogenic:
- ice core:
- residence time:
- sintering:

Background:

Although past and present changes in climate can be related and traced back to several different sources, scientists wishing to determine the past and present state of the climate, as well as future estimates of climate change, often analyze the amount, or concentration, of carbon dioxide (CO2) present in our planet's atmosphere. Current concentrations are relatively easy to measure, requiring only a small sample of the air. To obtain older concentrations from the past, however, scientists must be able to analyze previous states of the atmosphere through pristine air samples located in ice cores. By studying air trapped in these cores, an accurate picture of past CO2 levels can be reconstructed and compared to current levels, helping to establish a link between atmospheric CO2 variance and climate change.

The trapping of air within an ice sheet is a relatively slow process that occurs when air is allowed to circulate between the layers of snow which accumulate at the high elevations of an ice sheet. As additional snow accumulates on the ice sheet annually, the underlying layers from previous years are gradually buried and compressed, slowly shutting off the flow of air to subsurface layers. Increased pressure from the weight of the overlying layers eventually turns the snow into layers of ice, and at about 50 meters (165 feet) air from the outside atmosphere is no longer able to circulate among these layers. This lack of circulation, combined with increased compression, causes air which had been slowly diffusing to subsurface layers to be sealed off and trapped as small bubbles in a process known as sintering. The small amount of air contained within each bubble is never again exposed to the outside environment, thus forming a permanent record of the atmosphere at the time in which sintering occurred. Over time, each layer of ice and its associated air bubbles are buried deeper and deeper within the sheet. Scientists are then able to "reclaim" the air for study by drilling from the highest point of the ice dome and extracting a core of ice which can contain numerous annual layers of ice, some dating back hundreds of thousands of years. Sintered air within each layer can then be extracted and concentrations of key atmospheric constituents, such as CO2, can be measured and determined. By studying such concentrations, scientists can recreate past climatic aspects, such as global temperature, while determining the impact that natural and human factors have had on global climate.

Repeated evaluation of various ice cores shows, with high confidence, that CO2 levels reached a concentration of 280 parts per million (ppm) following the last glacial maximum and remained at this level for thousands of years. Around the turn of the 19th Century, however, concentrations began an accelerated increase, reaching 365 ppm by the end of the millennium, with nearly 70% of this increase occurring after 1950. This phenomenon, which has been labeled as the anthropogenic CO2 increase, can be linked to two major sources: the burning of fossil fuels and clearing of forested land. In this manner, carbon dioxide is being added to the atmosphere at a much greater rate than occurs naturally, causing an increase in global temperature and changing of global climate through the enhanced greenhouse effect.

Current Research:

During 2007-2011, CReSIS scientists collaborated with researchers from the University of Copenhagen to help with the North Greenland Eemian Ice Drilling - NEEM project, - an international ice core research project aimed at retrieving an ice core from North-West Greenland reaching back through the previous interglacial, the Eemian. To learn more about the NEEM project and drilling for ice cores – check out this link - http://neem.dk/about_neem/.

In this activity, you will examine two different carbon dioxide sources: recent measurements from air samples collected at the Mauna Loa Observatory in Hawaii and older concentrations from an actual ice core drilled in 1975 at the Law Ice Dome in Antarctica. Analysis of both types of values will allow you to recreate concentrations of CO_2 since 1010, determine the rate at which CO_2 concentrations have changed since the 18th Century, and estimate future concentrations.

Materials:

- Computer w/Microsoft Excel (or other graphing software)
- Data Set – Historical CO_2 Record from the Law Dome, Antarctica (1010-1975)
  - http://cdiac.ornl.gov/ftp/trends/co2/lawdome.combined.dat
    - Last data set at bottom of the page
- Data Set – Scripps Institution of Oceanography, CO_2 Concentrations from Mauna Loa Observatory, Hawaii (1959-2015)
  - ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2_annmean_mlo.txt
- Student Worksheet

In the above figure, the dashed red line with diamond symbols represents the monthly mean values, centered on the middle of each month. The black line with the square symbols represents the same, after correction for the average seasonal cycle.

Q1) What environmental factors might be responsible for the annual up and down nature of the red line?

Explore:

- Download the data set "Historical CO_2 Record from the Law Dome, Antarctica (1010-1975)" (see materials section, last data set at bottom of the page). Follow instructions from 'How to Import Data into Microsoft Excel' if necessary.

Q2) Find the following statistical information for CO_2 concentration (years 1010-1975): Mean. Median.

Q3) Find the mean CO_2 concentration for each century.

- Using Microsoft Excel, plot a graph of CO_2 concentration versus time, treating each century as a separate series.

  - Add a trend line to the data for each century (series).

Q4) Discuss what trends you can interpret from these averages.

Q5) Based on the rate of increase from 1900-1975, predict what the CO_2 levels will be in 2005. 2010.

Q6) How do these levels compare with the actual level of 387.4ppm in 2009?

Q7) What does this tell you about CO_2 concentrations?

Q8) Using the graph, determine, on average, the amount that CO_2 concentrations have increased during each century (1700s, 1800s, and 1900s).

Q9) Based on the graph and your calculations in questions 2-8, what predictions can you make about future CO_2 concentrations? Provide support for your prediction.

Consider the more recent CO_2 data collected at Mauna Loa Observatory in Hawaii.

- Download the data set “Scripps Institution of Oceanography, CO_2 Concentrations from Mauna Loa Observatory, Hawaii (1959-2015)” (see materials section).

- Construct a graph of the actual measured CO_2 concentration versus time.

Q10) What trends are noticeable with this data?

Q11) How do they compare to those from the Law Dome, Antarctica data?

Elaborate:

- Construct a combined graph using the average CO_2 concentration at the Mauna Loa site and the concentrations from the Law Dome site (1700-1975). Place each set of data on the same graph.

Q12) Describe the relationship between the data from Mauna Loa and Law Dome.

Q13) What conclusions can you draw about the accuracy of each collection method?

Q14) Refer to question 5, what should the CO_2 levels be in 2007?

Q15) How do these levels compare with the actual CO_2 levels measured at Mauna Loa?

Q16) What does this information tell you about the rate of increase of CO_2 concentrations?

CO_2 remains in the atmosphere for more than 400 years (IPCC, 2007), a process referred to as residence time. Greenhouse gas emissions are thus still in the atmosphere, meaning there is already a certain amount of CO_2 concentration increase locked in for the next several decades.

Q17) Write a short description of the activity you have just completed. Consider the following topics in your discussion:

- How have CO_2 concentrations changed in the past?

- How will CO_2 concentrations continue to change into the future?

- How would CO_2 concentrations change if society were to shift entirely to renewable and sustainable energy resources tomorrow?

Week 7	August 3 -7	Geography

1. Locate these areas on the map on the next page. Snip and use Paint or alternatives of paint such as **Paint**.NET. **Paint**.NET IrfanView. ...Pinta. ...Krita. ...Photoscape. ...Fotor. ...Pixlr. or you can manually draw.

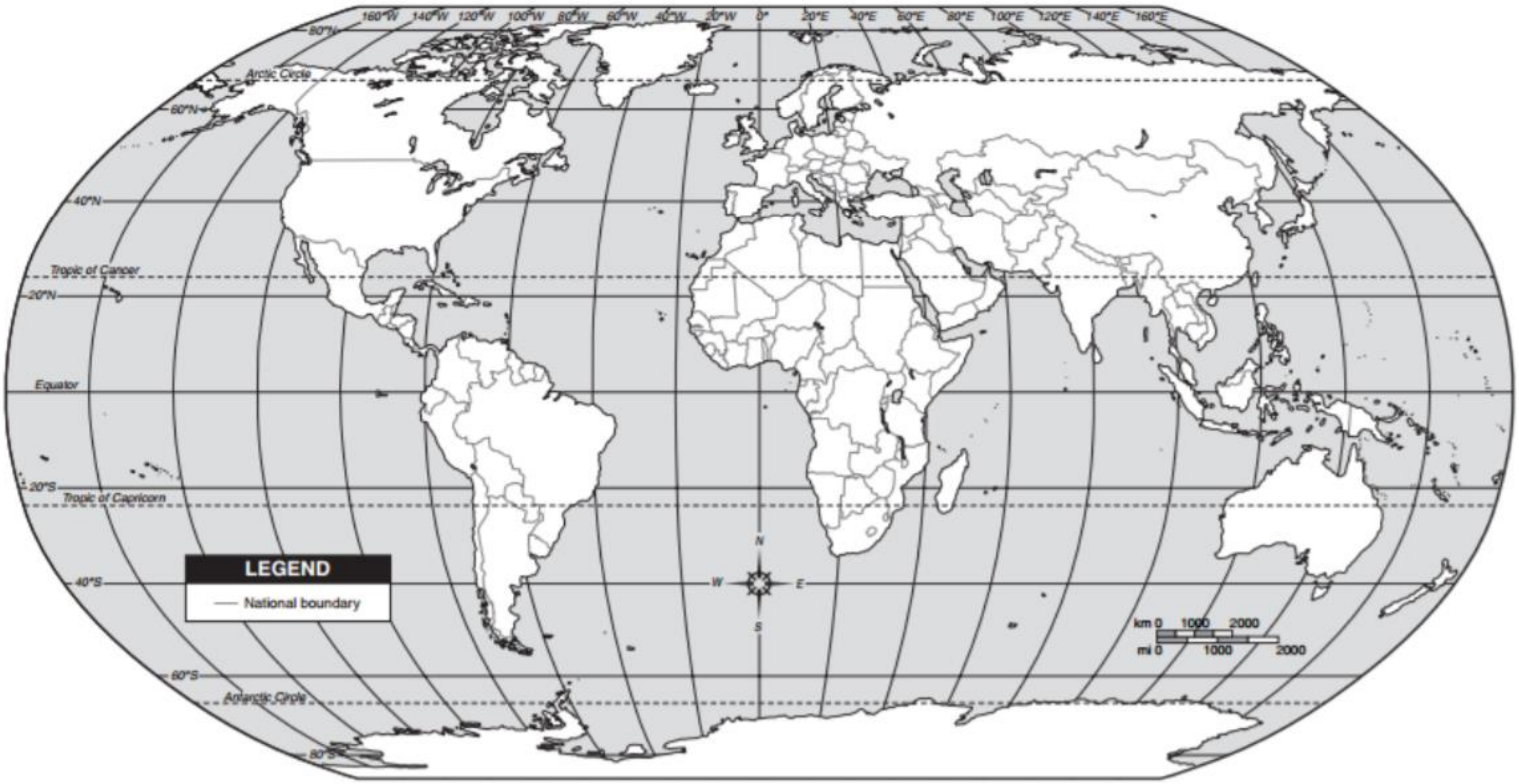
1. Africa
2. Alaska
3. Antarctica
4. Arctic Ocean
5. Asia
6. Atlantic Ocean
7. Australia
8. China
9. England
10. Equator
11. Europe
12. Everglades
13. Great Lakes
14. Greenland
15. Gulf of Mexico
16. India
17. Indian Ocean
18. Japan
19. Latitude
20. Longitude
21. Mediterranean Sea
22. Mexico
23. Middle East (the general area)
24. Mississippi River
25. North America
26. North Atlantic Ocean
27. North Pacific Ocean
28. North, South, East, West
29. Pacific Ocean
30. Rocky Mountains
31. San Andreas Fault
32. South America
33. South Atlantic Ocean
34. South Pacific Ocean
35. Southern Ocean
36. Tropic of Cancer
37. Tropic of Capricorn

2. Which states comprise the following regions of the U.S.

a. Great Plains,
b. Northwest,
c. Southwest,
d. Mid-Atlantic,
e. Midwest,
f. Northeast, and
g. Southeast.

3. Identify the following agency of the United States of America

- CDC
- EPA
- FDA
- FEMA
- NASA
- NIH
- NOAA
- UN
- USDA
- BLM



160°W
140°W
120°W
100°W
80°W
60°W
40°W
20°W
0°
20°E
40°E
60°E
80°E
100°E
120°E
140°E
160°E
80°N
Arctic Circle
60°N
40°N
Tropic of Cancer
20°N
Equator
20°S
Tropic of Capricorn
40°S
60°S
Antarctic Circle
80°S
LEGEND
National boundary
N
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W
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km 0 1000 2000
mi 0 1000 2000

Week 7	August 3 -7	Physical Science Review

1. What is matter?

2. What is mass?

3. What is the relationship between atoms and elements?

4. What is the relationship between atoms and molecules?

5. What is a molecule?

6. What is an isotope?

7. What is a half-life?

8. The half-life of Zn-71 is 3.5 minutes. If there 100.0 g of Zn-71 at the beginning, how many grams would be left after 7.0 minutes has elapsed?

9. What types of elements form ionic bonds? What are some properties of an ionic bond?

10. What types of elements form covalent bonds? What are some properties of a covalent bond?

11. What types of elements form hydrogen bonds? What are some properties of a covalent bond?

12. Water has several inherent properties that make it essential to life on Earth. Describe the following properties and explain why they are important to life:
    a. Polarity
    b. Surface tension
    c. Capillary action
    d. High specific heat
    e. Expands as a solid
    f. Less dense as a solid
    g. Acts as a solvent
13. What is pH? What is the pH of an acid? A base? A neutral substance?
14. What is a buffer?
15. State the law of conservation of matter.
16. What is the difference between an organic compound an inorganic compound?
17. Define energy. What are some units of energy?
18. Define power (in terms of energy). What are some units of power?
19. What is the difference between potential and kinetic energy?
20. State the first law of thermodynamics.
21. State the second law of thermodynamics.
22. What is entropy?
23. What is LeChatlier's principle? How does it affect a system (reaction) at equilibrium?

Week 8	August 10-14	Life Science Review

1. There are four basic types of organic compounds in living organisms. For each one, identify the elements it contains and the function of the compound in living organisms.
    - Carbohydrates
    - Lipids
    - Proteins
    - Nucleic acids
2. Define or describe the following terms:
    - Producer
    - Autotroph
    - Consumer
    - Heterotroph
    - Decomposer
    - Detritivore
    - Scavenger
    - Food chain
    - Food web
3. Be able to draw food web from simple food chains.
4. What is a trophic level? What is the difference between a primary, secondary, and tertiary consumer?
5. What does an energy pyramid show?
6. Describe the reactants and products of photosynthesis in the chemical formulas and words.
7. Describe the reactants and products of aerobic respiration in the chemical formulas and words.
8. Describe the reactants and products of anaerobic respiration in words.
9. What is productivity?
10. What is biomass?
11. What are the basic processes, sources and sinks found in the water cycle?
12. What are the basic processes, sources and sinks found in the carbon cycle?
13. What are the basic processes, sources and sinks found in the nitrogen cycle?
14. What is the relationship between mutations, adaptations, natural selection, and evolution?
15. What is the difference between a niche and a habitat?
16. What is the function of the following systems in an organism?
    - Circulatory
    - Digestive
    - Endocrine
    - Excretory
    - Immune
    - Integumentary
    - Muscular
    - Nervous
    - Respiratory
    - Skeletal

Week 9	August 17-21	Weather & Climate Issues

Using at least <u>100 words</u>, answer the question listed below. Count and number every 10 words. If you use any resources, list them at the bottom.

What is the most important weather, climate, or meteorological issue/topic currently impacting Earth? Explain your answer with ideas and/or facts.

Week 10	August 24-28	Environmental Science Literacy: The Truth Behind Bottle

Article:

(1) Even though your tap water is most likely clean and safe to drink, you've probably used a lot of bottled water in your life, or know people who do. Why would anyone pay for bottled water when they have easy access to drinking water in their home? Our modern day concept of bottled water only began when the French company, Perrier, expanded into the North American market in 1976. They began an intensive advertising campaign to convince Americans that bottled water should be a significant beverage choice. Up to that point, almost everyone got their drinking water from wells or their taps and would never think of buying bottled water.

(2) Initially it was hard for bottled water companies to convince the average citizen to pay for water, so these companies began marketing campaigns that made tap water seem unhealthy and bottled water seem like the safer choice. Huge bottled water brands like Dasani (owned by Coca-Cola) and Aquafina (owned by Pepsi) now admit that they use tap water in their bottles, though years of misleading marketing have made most consumers think that bottled water comes from a superior and healthier natural source. For example, the brand Everest Water isn't from Mount Everest, it's from Corpus Christi Texas, and Glacier Clear isn't from a glacier, it's from taps in Greenville Tennessee.

(3) Why have 30% - 40% of bottled water companies decided to use tap water? It's because they recognize that tap water is safe and also very cheap. They can make huge profits by charging consumers a large price for something that's very inexpensive for them to make. Manufacturers spend less than 10 cents to make one bottle of water while they charge consumers $0.99 to $2.50 to buy it. Per liter, bottled water is more expensive than the gasoline we put in cars. Bottled water companies have been so successful that bottled water now outsells alcohol, juice and soda in North America. North Americans spend over $16 billion on bottled water a year.

(4) Bottled water is usually contained in PET / PETE bottles. PET is short for polyethylene terephthalate which is the most common type of plastic used for soda, juice and water containers. You will find a number 1 on the bottom of a PET bottle which indicates that the material is PET and can be recycled. PET has been the material of choice for plastic bottles because it seals in liquids, is lightweight, impact resistant and can be made transparent. It's also cheap for manufacturers to make so this helps keep their costs down and keeps their profits high.

(5) PET is a pretty remarkable material, but it has its downsides. PET is made from naphtha, which comes from non-renewable fossil fuels like natural gas and petroleum. Though it's recyclable, only of PET plastic bottles make it into the recycling system, and for those bottles that are recycled, most are actually 'down-cycled". This means that used plastic bottles are turned into a lower quality materials that aren't as strong as the original PET. Once PET has been down-cycled into another product, it usually isn't strong enough to be down-cycled again after that product is no longer of use. That's when it ends up in a landfill. Down-cycled PET materials are typically used to make furniture, carpets and polar fleece for clothing.

(6) Before the adoption of plastic beverage bottles, most beverages came in refillable glass containers. To this day, some places in North America still accept glass wine and beer bottle returns. When this happens, the average beer bottle is cleaned and refilled up to 15 times before it finds itself broken and in need of recycling. This type of reuse saves a lot of materials and energy because there was no need to make 14 brand new bottles. Refilling glass bottles is made possible because glass is inert so it doesn't absorb beverage particles like PET does. Glass also holds up well under the high heat needed for the sterilization of the bottle, while PET would just begin to melt. Before the widespread use of PET plastic bottles, beverage containers were thought of as multi-use containers except where cans were concerned. Now we've been convinced to think of most beverage containers as single use and ready for the trash after our last sip.

(7) The problem with this disposable attitude is that all the PET eventually ends up in the landfill or in our oceans. PET doesn't biodegrade, but it can photodegrade. This means it needs to be exposed to the Sun to break down. Most plastics in landfills are buried so they'll never be exposed to the Sun PET that ends up in the oceans is a different matter. Since PET floats, it will be exposed to the Sun, but this causes the PET to break down into toxins and into small pellets that are ingested by marine life. Turtles and other sea creatures are found with bellies full of plastic.

8) Some parts of the world are beginning to realize that the huge environmental impact of bottled water isn't acceptable. In 2009, Bundanoon, a small town in New South Wales, Australia, decided that it would be the first town in the world to ban the sale of bottled water. Local governments in San Francisco, Toronto, and over 70 cities around the world have also instituted municipal bans on purchasing bottled water for their employees.

Questions:

1. What did bottled water companies do to convince us to buy bottled water?
2. What is PET and what are some of its properties?
3. What is down-cycling and why is PET down-cycled?
4. When PET photodegrades in ocean ecosystems, why is this harmful?
5. What are some things governments have done to help decrease the harmful impact of PET?
6. What are two things you can do to decrease the number of PET bottles you contribute to landfills?