Incoming AP Environmental Students Summer Work 2019-2020

"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."

-Aldo Leopold

It is vital to start the upcoming academic year off on the right foot. You have decided to challenge yourself by taking a course that will test all that you know about the environment and its unique link to your daily activities. I commend you for making a brave and thoughtful choice.

The contents of this packet that need to be **completed for the first day** of school August 26th:

Assignments-

1. Introduction to the **vocabulary** necessary for the first Unit Test: Earth Systems Science. Complete using an online credible resource or a credible website.

2. You Tube **Videos** with questions based on the Theory of Plate Tectonics. Answer all 15 questions.
   National Geographic Colliding Continents: https://www.youtube.com/watch?v=3sd6vQA3yws

3. You Tube **Videos** with questions based on the Theory of Atmosphere. Answer all 7 questions.
   National Geographic Our Atmosphere: https://www.youtube.com/watch?v=5Tz8oyuT4E0

4. Find an image on the **three-cell model for atmospheric circulation**. Print the image out and answer the following questions using the image you found. Bring the image to class the first day.
   a. What is meant by a prevailing wind? What are the names of the three prevailing winds in the northern hemisphere?
   b. How can climate (temp + precip.) influence the location of life on the planet?
   c. What is atmospheric pressure? How is the air moving in a low-pressure system? High pressure system?
   d. What is the Coriolis Effect? How does it impact earth's fluids in the northern hemisphere? southern hemisphere?

5. Complete ***Investigation 2- Plate Tectonics***. Follow all directions in the lab and answer all the questions to the best of your ability. Use only the space provided for answers, do not write in the margin when answering as you will eventually be placing this lab in your marble composition lab book on the second day of class.

6. Complete the **Layers of the Atmosphere** lab. Construct/color the graph and answer the questions on the space provided. Be sure to use the entire graph space. This lab will be placed into your Marble Composition Lab Book that you will need to bring in for the first day of class.

7. As a student in this class the changing policies regarding the protection of the environment are more prevalent in our news feeds. **Find an article** in the news and summarize what caught your attention and what aspects of the article caused you to have questions. No need to print-out the article just keep the link to share with me the first week.

When printing out this packet **do not print the labs front to back** as they will be taped into a lab book.

This is an important list of 7 items that should be completed upon return to school in August. The need to be resourceful and determined begin with these assignments. Have a safe, fun and relaxing summer. Look forward to meeting you.

You'll need a **Marble Composition Notebook** for the first day as the completed labs will be placed inside your "Lab Book" for the first time. These labs will be collected once the labs are placed inside your lab book on Day 2.

Use this link to find a pdf version of your textbook that you can purchase.
http://www.nxtbook.com/nxtbooks/ngsp/livingintheenvironment/index.php#/4

Email Mr. Dickson if you have any questions during the summer!

APES Teachers

APES: Unit 4 Vocabulary – Earth Systems and Resources (Geosphere)

Directions:

- Use any creditable web site, text, and any other resources to define the following terms related to the study of Earth Science Concepts. You will have a need to understand these terms for the first test and beyond.

1. **Geologic Time Scale:** _____
2. **Theory of Plate Tectonics:** _____
3. **Earthquakes:** _____
4. **Fault/Locked Fault:** _____
5. **Volcanism:** _____
6. **Divergent Plate Boundary:** _____
7. **Convergent Plate Boundary:** _____
8. **Transform Plate Boundary:** _____
9. **Subduction zone (convergent boundary):** _____

10. **Seafloor Spreading:** _____

11. **Island Arcs:** _____

12. **Rift Valley:** _____

13. **Earth's Seasons:** _____

14. **Variation of Solar Intensity with Latitude:** _____

15. **Parent Material:** _____

16. **Differentiation:** _____

17. **Asthenosphere:** _____

18. **Convection Cell:** _____

19. **Earth two crust types(compare):** _____

20. **Lithosphere:** _____

21. **Rock cycle:** _____

22. **Three main rock types (compare characteristics):** _____

23. **Plasticity:** _____

24. **Mineral Resource:** _____

25. **Ore:** _____

26. **Triple junction:** _____

27. **Hot spot:** _____

28. **Ring of Fire:** _____

29. **Hydrothermal Vents**: _____

30. **Lava/magma:** _____

31. **Erosion**: _____

32. **Weathering:** _____

33. **Chemical reservoir**: _____

34. **Paleomagnetism**: _____

35. **Residence time:** _____

36. Once you have defined the terms above, use the space below to write a summarizing paragraph using at least 7 of the terms. Your writing should demonstrate an understanding of the connection among the terms chosen.

APES: Unit 4 Vocabulary – Earth Systems and Resources (Atmosphere)

Directions:

- Use any creditable web site, text, and any other resources to define the following terms related to the study of Earth Science Concepts. You will have a need to understand these terms for the first test and beyond.

37. **Earth System Science:** _____

38. **Atmosphere:** _____

39. **Climate:** _____

40. **Microclimate:** _____

41. **Climate change:** _____

42. **Electromagnetic spectrum:** _____

43. **Insolation:** _____

44. **Global warming:** _____

45. **Greenhouse effect:** _____

46. **Greenhouse gases(top 5 list in order by percentage):** _____

47. **Rain Shadow:** _____

48. **Polar amplification:** _____

49. **Chlorofluorocarbons (CFCs) :** _____

50. **Atmospheric pressure:** _____

51. **Troposphere:** _____

52. **Stratosphere:** _____

53. **Temperature:** _____

54. **Relative humidity:** _____

55. **Photodissociation:** _____

56. **Rain out:** _____

57. **Anthropogenic processes:** _____

58. **Atmospheric window:** _____

59. **Coriolis effect:** _____

60. **El Nino:** _____

61. **La Nina:** _____

62. Climatogram: _____

Printout or draw a simple version for Chester county below.

63. Once you have defined the terms above, use the space below to write a summarizing paragraph using at least 7 of the terms. Your writing should demonstrate an understanding of the connection among the terms chosen. List the terms chosen for the essay on the space below.

Name: _____ Date: _____

APES Summer Assignments: YouTube Videos

Directions:

- Please visit the links listed below. Answer all questions, and complete all diagrams.
- Please be prepared to answer test questions based on this information within the first week of class.

I. National Geographic Colliding Continents:

Video 1: https://www.youtube.com/watch?v=3sd6vQA3yws

1. According to the video, when and how was the Earth created?

   _____

   _____

2. What process/force was involved form during the early formation of the solar system? Please be as specific as possible.

   _____

   _____

   _____

   _____

   _____

3. During the early evolution of Earth, a process begins deep within the planet leading to the formation of the first landmasses. Describe this process. Include a discussion of the specific elements mentioned, and where these elements eventually settled. What are the primary elements for each of earth's layers?

   _____

   _____

   _____

   _____

   _____

   _____

   _____

4. Where did water on Earth come from?

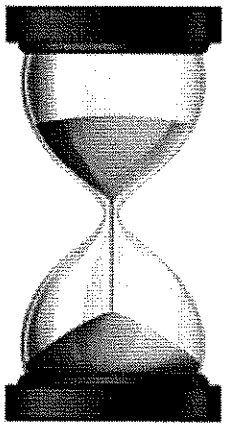
   _____

   _____

5. What type of buoyant rock forms the nucleus of the continents?

   _____

6. Scientists look for zircons containing uranium to determine the age of rocks on Earth. Using the following diagram, discuss how these zircon crystals are used to determine the age of rocks.



7. What is a "Craton?" For clarification, you may want to look this up on another website.

8. How did life (living organisms), emerging some 3.8 million years ago, influence the development of granite?

9. Draw a diagram of the Mid-Atlantic ridge, and describe how new crust is formed along these divergent plate boundaries.

10. The video states that the "Earth has a constant surface area." How can this be true if new crust is always forming at ridge zones (divergent plate boundaries)? Draw a diagram of a subduction zone to help illustrate your explanation.

11. Pangaea was the Earth's last (most recent) super-continent. How did the size of this land mass affect Earth's climate (approximately 250 million years ago), and how did this these climate changes influence life at that time?

12. What surface feature is formed when two plates collide and neither is subducted? Please list two examples of this phenomenon.

13. Describe how and when the Grand Canyon was formed.

- _____
_____
_____
_____
_____
_____
_____

14. How did the formation of the Isthmus of Panama change the climate on Earth?

- _____
_____
_____

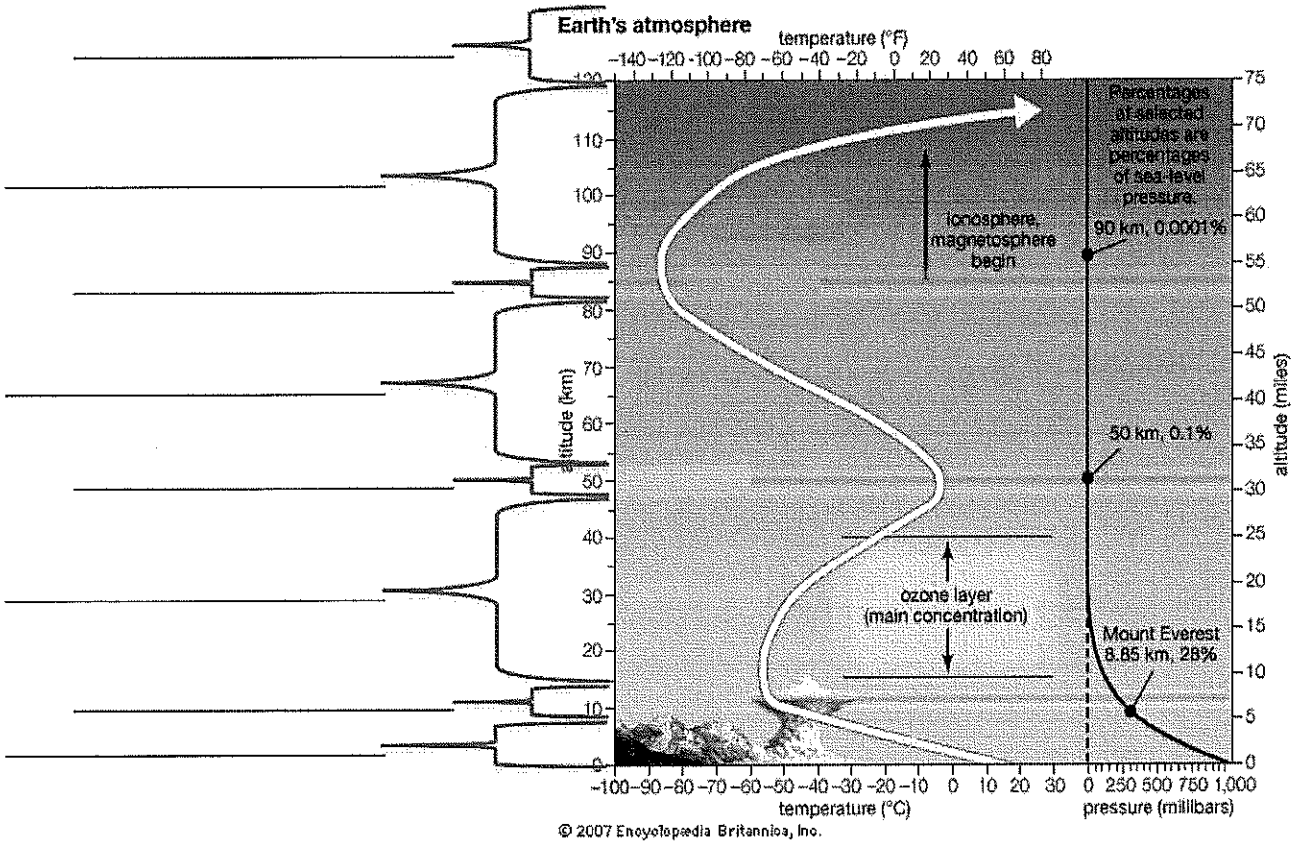
15. List three types of geologic events (activity) that occur along plate junctions leading to major loss of life and property.

    - _____
    - _____
    - _____

II. A Journey Through the Atmosphere:

- Video 2: National Geographic Our Atmosphere Earth Science - YouTube
- *https://www.youtube.com/watch?v=5Tz8oyuT4E0*

1. On the diagram below, label the five main layers of the atmosphere and the names of the transition layers. You may need to refer to sources other than the videos listed above.



2. Describe each layer of the Earth's atmosphere. Please refer to the information contained in both videos.

a. **Troposphere:** _____

_____

_____

_____

_____

b. **Stratosphere:** _____

_____

_____

_____

_____

_____

c. **Mesosphere**: _____

d. **Thermosphere**: _____

e. **Exosphere**: _____

3. What would happen to Earth's climate if there were no atmosphere?
   - _____
4. What happens to atmospheric pressure as you move up in altitude, and why is this so?
   - _____
5. Why does it get colder as you move up in altitude?
   - _____
6. Define "lapse rate," and list what the lapse rate is for the Earth's atmosphere.
   - _____
7. Describe how the greenhouse effect works. What gases are involved?
   - _____

INVESTIGATION

2

Plate Tectonics

Project

PURPOSE

- Plot key geologic events and correlate them to tectonic plate boundaries

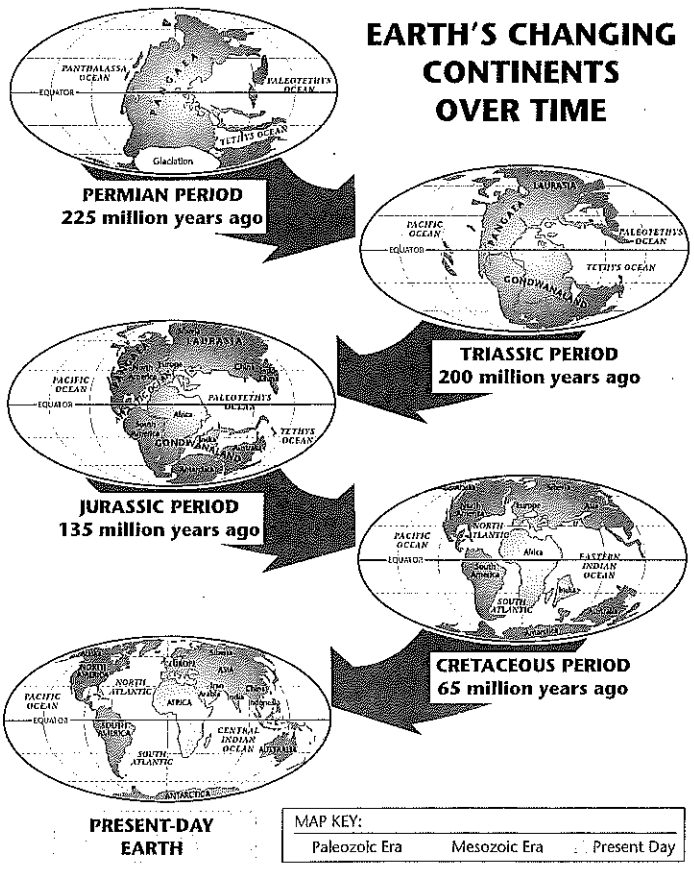
INTRODUCTION

In the 1960s and 1970s it was becoming obvious that the map of Earth's continents has been continuously changing over a large portion of geologic history.

Fig. 2-1

Earth's Continents Over Last 225 Million Years

The theory of plate tectonics explains the drift of continents and related geological events.



Continental land masses crashed into and moved away from each other for over 2.0 billion years. These movements can be inferred from present-day geologic features resulting from these collisions and breakups. Rocks and fossils found in western Africa are also found in eastern South America. And scratches left on rocks by moving glaciers suggest how continents have moved over the last 300 million years.

The idea of drifting continents was first proposed in 1912 by Alfred Wegener, who observed that the continents seem to fit together like the pieces of a puzzle. Although the evidence suggested that Wegener was correct, he could not find a mechanism to explain how whole continents could move thousands of miles across the Earth's surface.

It is now believed that the continents move on pieces of the Earth's crust called **tectonic plates**. The surface of the Earth seems to be divided into seven or eight major plates and maybe a dozen smaller ones. The best explanation for the mechanism is that heat escaping from the planet's interior creates convection currents that move the plates into and away from each other. From a geological point of view, the most interesting places are the plate boundaries where the plates collide, separate, or slide past each other. Scientists infer the size, shape, and location of the plates by a process similar to the one you will undertake in this project.

In this investigation you will plot the locations of recent earthquakes, volcanic eruptions, and mountain ranges on a world map (see **Fig. 2-2**). These events are not evenly distributed over the Earth. You will be asked to look for patterns in the locations of these occurrences globally and discuss how they affect the planet and its inhabitants.

Procedure

Step 1 Go to the following Internet site:

http://neic.usgs.gov/neis/bulletin/

Using small circles as markers, mark on the world map the location of the 25 most recent earthquakes that are not in the same locale.

Step 2 Plot the location of the following volcanoes, using small triangles on the map.

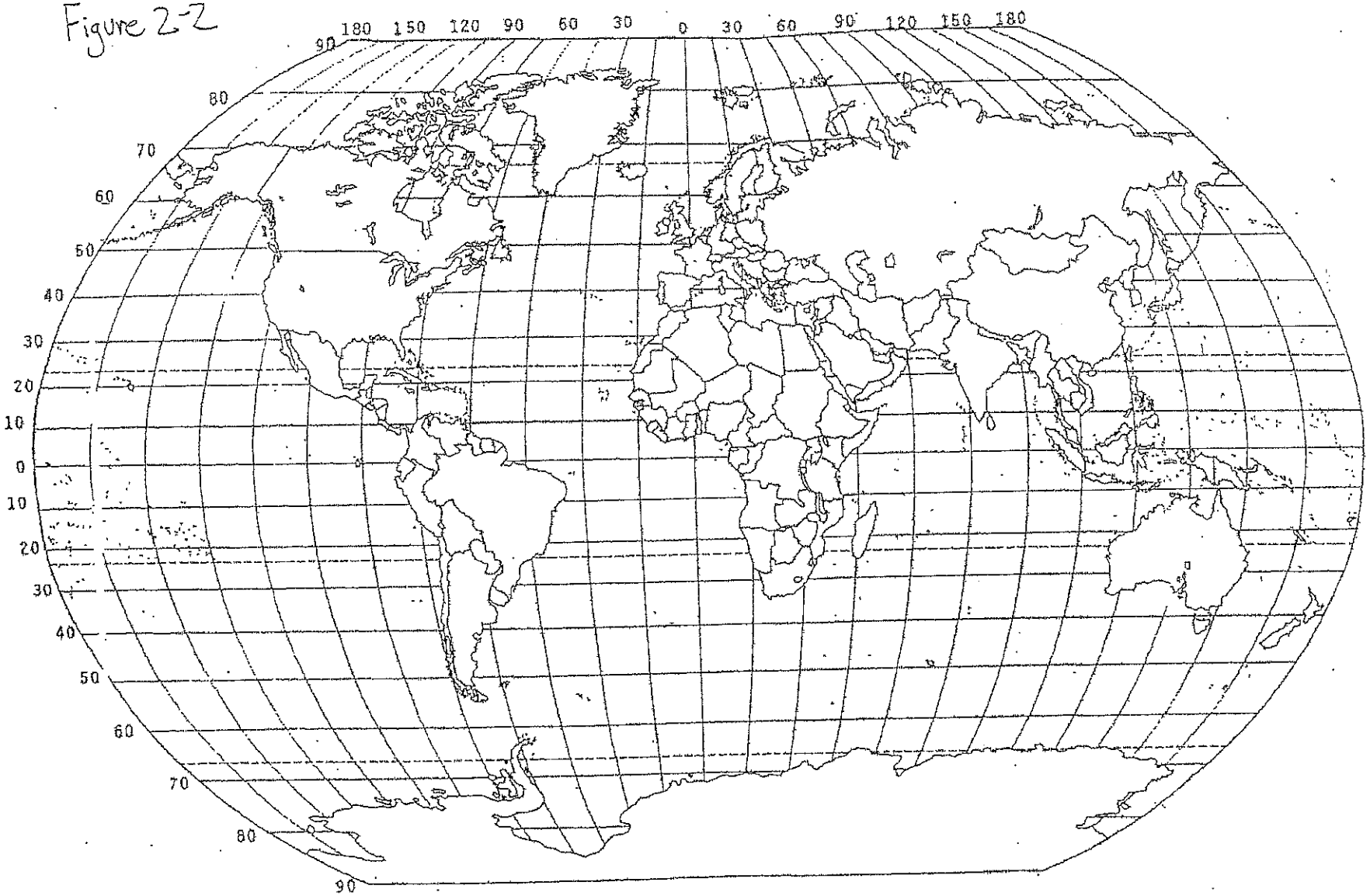
Mt. Etna, Italy - 37.73N, 15.00E
Ayelu, Ethiopia - 10.082N, 40.702E
Likaiu, Kenya - 2.17N, 36.36E
White Island, New Zealand - 37.52S, 177.18E
Santorini, Greece - 36.4N, 25.4E
Askja, Iceland - 65.03N, 16.75W
El Chichon, Mexico - 17.4N, 93.2W
Mt. Wrangell, USA - 62.66N, 144.12W
Redoubt, USA - 60.5N, 152.7W
Mount Rainier, USA - 46.58N, 121.75W
Lassen Peak, USA - 40.5N, 121.5W
Unimak Island, USA - 54.47N, 163.9W
Mt. Pelee, West Indies - 14.8N, 61.1W
Blup Blup, Papua New Guinea - 3.5S,144.6E
Pinatubo, Philippines - 15.13N, 120.35E
Tambora, Indonesia - 8.3S, 118.0E
Gamalama, Indonesia - 0.8N, 127.3E
Irazu, Costa Rica - 9.979N, 83.853W
Lascar, Chile - 23.32S, 67.44W
Nevado del Ruiz, Columbia - 4.9N, 75.3W
Krasheninnikov, Russia - 54.58N, 160.26E
Fuji, Japan - 35.4N, 138.7E
Chaine des Puys, France - 45.5N, 2.8E
Soufriere Hills, Montserrat - 16.7N, 62.2W
Ararat, Turkey - 39.70 N, 44.28 E
Savo, Solomon Islands - 9.1S, 159.8E

Step 3 Again, using the map, shade in locations for the following mountain ranges.

Alps	California Coast Ranges	Karakoram
Andes	Carpathians	Mid Ocean Ridges
Appalachians	Cascades	Scandinavian Mts.
Atlas	Dolomites	Sierra Nevada
Balkin Mts.	Himalaya	Urals

Fig. 2-2
World Map

Figure 2-2



Use this larger map for all plotting activity. (Steps 1-3)

Questions

1a. What patterns do you observe in the locations of these earthquakes, volcanoes, and mountain ranges?

b. Why do these events seem common in some areas on Earth and rare in others?

c. Using **Fig. 2-3**, compare your plotted positions with plate boundary locations. Describe any correlations.

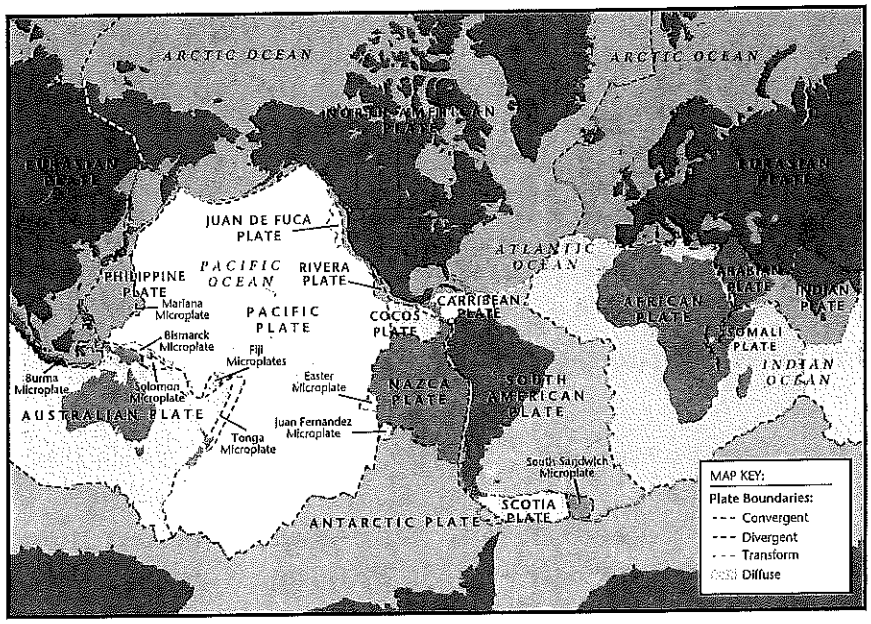


Fig. 2-3: Earth's Plate Boundaries

d. How does the theory of Plate Tectonics explain these similarities of location? Describe how the theory of Plate Tectonics is strengthened by these patterns.

2. What is meant by the term ***Ring of Fire***?

3a. How do the Ayelu and Likaiu volcanoes fit into the pattern you have observed?

b. What processes are going on in eastern Africa? Explain what is meant by a ***triple junction***.

Questions

c. About two hundred million years ago a similar process occurred. (Refer back to **Fig. 2-1**, historical maps of Earth's drifting continents.) Describe this process.

4a. What are ***hot spots***? Look at **Fig. 2-4**, showing a geological section of the Hawaiian Islands. What do hot spots tell us about plate movement?

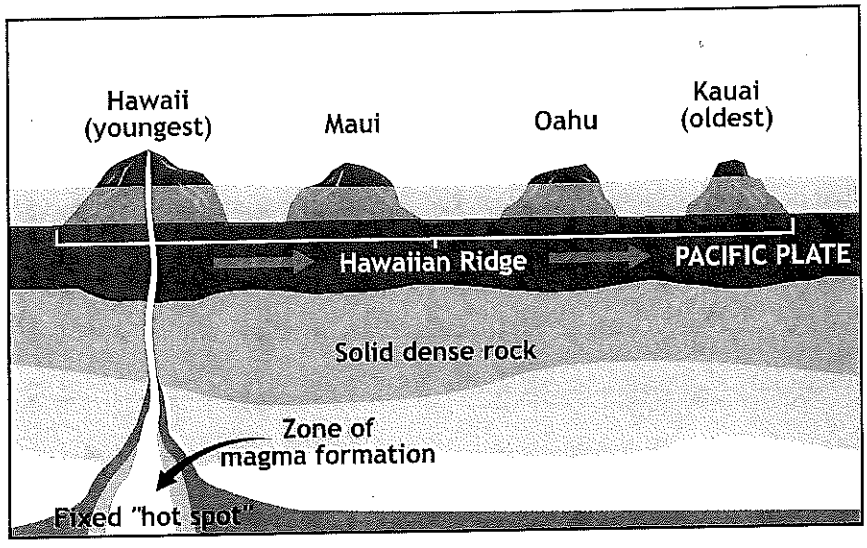


Fig. 2-4: Geological Map of the Hawaiian Islands

b. Refer to **Fig. 2-5**. How has the hot spot in the Yellowstone region given clues about the movement of the North American Plate? Yellowstone National Park is in the upper right-hand corner of the image.

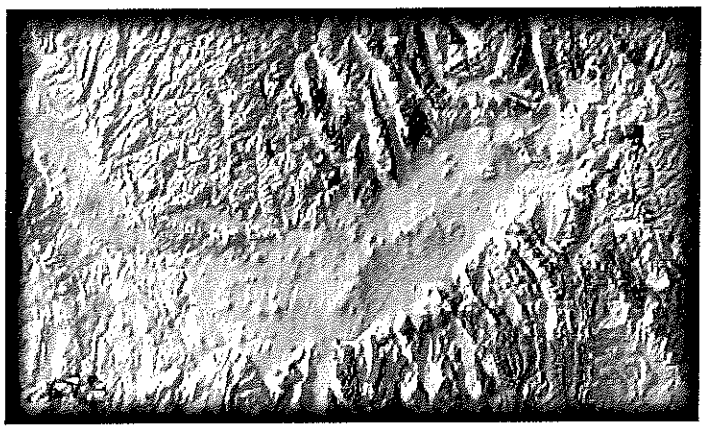


Fig. 2-5: The Snake River Plain

c. Scientists have determined that plates move at different speeds. Some travel as slow as 2 cm/yr and others as fast as 15 cm/yr. Describe how hot spots could be used to determine the speed of plate movement.

d. What information and measurements would you need to calculate the rate of movement?

5a. How did the Himalaya and Karakoram mountain ranges form? Twenty-two mountains in these mountain ranges are 8,000 m (26,240 ft) or higher, with Mt. Everest being the tallest on Earth at 8,850 m (29,028 ft). Why are these ranges so high even though they are not near a coast line?

b. Compare the Urals, another range in the list that is not near a continental edge, to the Himalaya and Karakoram. The highest mountain in the Urals is Naroda Mountain at 1,895 m (6,215 ft). Why are the Himalaya and Karakoram so much higher than the Urals?

Questions

Name: _____ Date: _____

Lab: Layers of the Atmosphere

Objective: To discover how the atmosphere can be divided into layers based on temperature change at different heights, by making a graph.

Directions:

1. Read the writing on the Earth's Atmosphere.
2. Graph points from the temperature table onto the atmosphere graph.
3. Neatly draw a smooth line between the points.

Using the writing as a guide:

4. Using a ruler, draw a dotted line and label each of the "pauses"
5. Neatly label each of the four layers of the atmosphere.
6. Label where the ozone layer is located.
7. Neatly draw in each of the drawings in table 2, in their appropriate place within the correct layer.
8. Answer the questions.

Background: The Earth's Atmosphere

The atmosphere can be divided into four layers, based on temperature variations. Since each layer is based upon temperature changes, the layers are not separated in equal distances. The layer closest to the Earth, and with the lowest altitude, is called the troposphere. Above this layer is the stratosphere, followed by the mesosphere, then the thermosphere. The upper boundaries between these layers are known as the tropopause, the stratopause, and the mesopause. Imagine the atmosphere like a cake with unequal layer thickness. The layers of the cake are the different "spheres", where the frosting between the layers is similar to the boundaries between the layers with the suffix "pause". Temperature variations in the four layers are due to the way solar energy is absorbed as it moves downward through the atmosphere.

TROPOSHERE - The Earth's surface (land and ocean) is the primary absorber of solar energy, specifically UV (ultra-violet) radiation. Some of this energy is reradiated by the Earth as heat in the form of infrared radiation (IR) , which warms the overlying troposphere. The average temperature in the troposphere rapidly decreases with altitude, until it reaches the tropopause (the boundary between the troposphere and the stratosphere). The jetstream is located at the tropopause.

Since gravity is strongest near the Earth's surface, the troposphere has the majority of the Earth's gas molecules and aerosols (water, sulfuric acid, etc). The density of gas is instrumental in flying commercial aircraft, as most cannot fly higher than the troposphere. The troposphere is also where all of the World's weather occurs. All mountains, even Mount Everest all exist inside the troposphere

STRATOSPHERE - The temperature remains constant in the stratosphere for the first 10 km, and then increases with altitude. This warming is caused by a form of oxygen called ozone (O_3). Ozone protects us from most of the sun's ultraviolet radiation, which can cause cancer, genetic mutations, and sunburn. Oxygen (O_2) normally consists of two oxygen molecules. To break these molecules apart requires a lot of energy, which comes from absorbing solar UV radiation. The stranded individual oxygen molecules (O) then fuse (join) with another O_2 molecule, forming ozone (O_3). Oxygen does not like bonding three molecules (three's a crowd), as in ozone, and to keep the ozone together requires a lot of energy, which again is absorbed from the solar UV radiation. Through the whole process of creation and sustaining ozone, ozone absorbs approximately 25% of the ultraviolet radiation from the sun. The ozone layer begins where temperature increases in the stratosphere and is, on average, 10 km thick.

At the stratopause, the temperature stops increasing with altitude. Only specially designed aircraft, such as the Concorde (the World's fastest commercial airliner), or the SR-71 Blackbird can fly in the stratosphere. This is the highest layer that weather balloons can fly.

MESOSPHERE - The mesosphere does not absorb solar radiation, so the temperature decreases with altitude. The mesosphere reaches the coldest temperatures in the atmosphere, down to -90°C (-130°F). The start of the coldest readings is called the mesopause.

Though there is great distance between molecules in the mesosphere, the molecules are closer than compared to the overlying thermosphere. When asteroids hit our atmosphere they become meteors. The friction of the mesosphere's molecules against the meteor heats the meteor so hot that it can be seen from the ground, often called: "a falling star".

THERMOSPHERE - The temperature begins to increase with altitude, and this trend continues throughout the thermosphere. Here solar radiation first hits the Earth's atmosphere and heats it. Because the atmosphere is so thin, a thermometer cannot measure the temperature accurately and special instruments are needed. Because of the great spacing between molecules, the thermosphere has high temperatures, but very low heat.

The space shuttles, satellites, and space station all fly within the thermosphere. They are required to stay within this boundary to ensure that they remain captured by Earth's gravity and stay in orbit around the Earth. The Earth's magnetic field also extends and protects the Earth from solar wind. When this occurs it causes a natural wonder, the Aurora Borealis (a.k.a. northern lights).

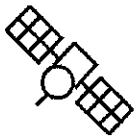
Above the thermosphere is an area where the atmosphere meets space, and where the Earth's gravity can no longer firmly hold molecules with gravity. This area, where molecules escape, is called the exosphere.

Table 1: Average Temperature Readings at Various Altitudes

Altitude (km)	Temp (°C)	Altitude (km)	Temp (°C)
0	15	55	-7
5	-18	60	-17
10	-49	65	-33
12	-56	70	-54
20	-56	75	-65
25	-51	80	-79
30	-46	84	-86
35	-37	92	-86
40	-22	95	-81
45	-8	100	-72
48	-2	110	-55
52	-2	130	-20

TABLE 2

Common items found at different layers

			
Commercial Aircraft	Satellite	Meteor	Weather Balloon
	 Multi colored		
Mountain	Aurora Borealis	Weather	

Questions:

1. What is the basis for dividing the atmosphere into four layers?

2. As altitude increases, does the temperature *increase* or *decrease* in the:

   Troposphere? _____ Stratosphere? _____

   Mesosphere? _____ Thermosphere? _____

3. What is the approximate height (km) and temperature (°C) of the:

   Tropopause: _____ _____

   Stratopause: _____ _____

   Mesopause: _____ _____

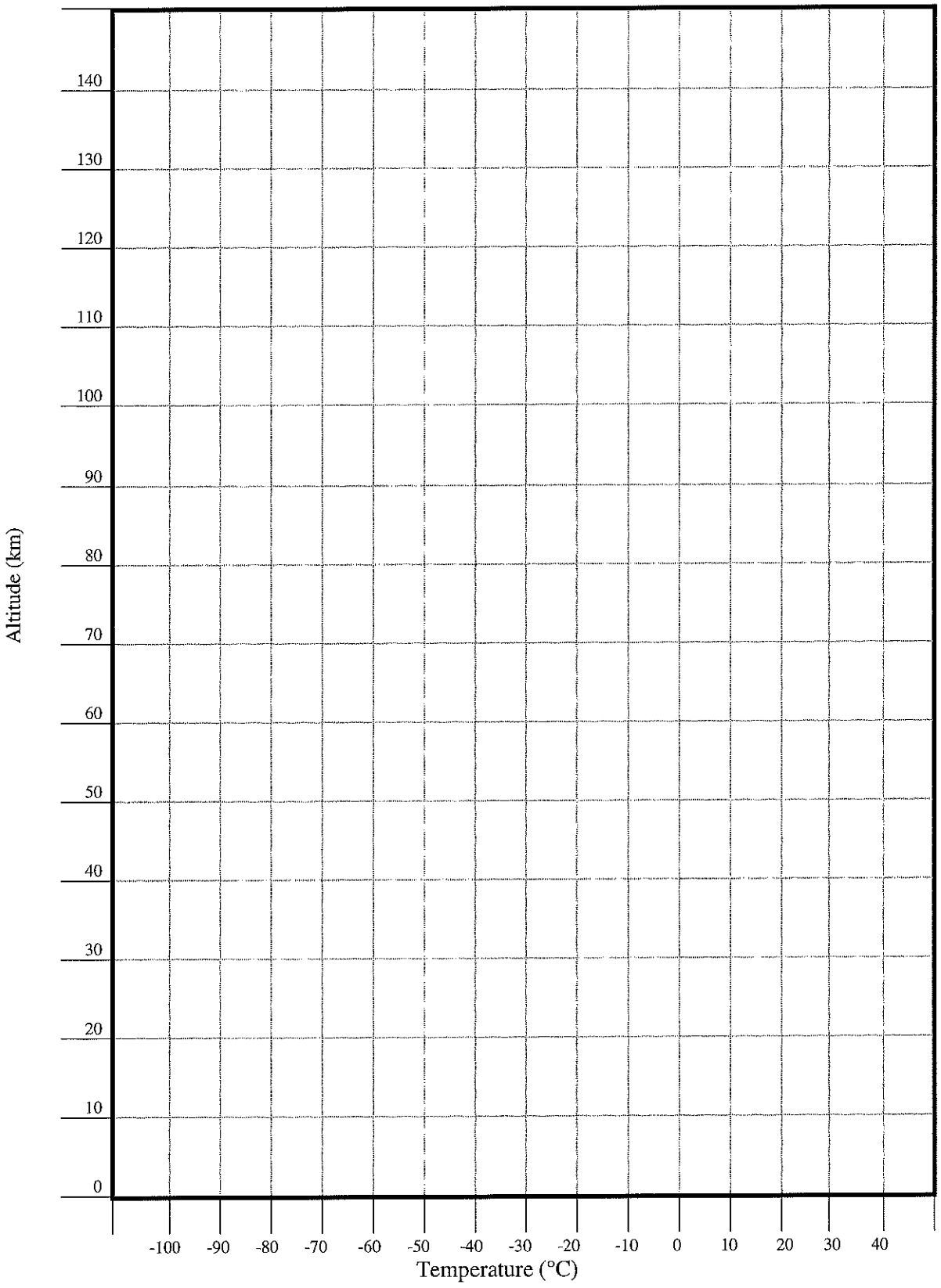
4. What layer does our weather exist in?

5. Where is the ozone layer located?

6. Why is the ozone layer important?

7. What causes the temperature to increase with height through the stratosphere?

8. What causes the temperature to decrease with height through the mesosphere?


Altitude (km)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40
Temperature (°C)