

Lab - Layers of the Atmosphere***Please Turn In This Assignment*****Introduction**

The four layers from the bottom upward are referred to as the troposphere, stratosphere, mesosphere and thermosphere. The upper boundaries between these layers are referred to as the tropopause, the stratopause and the mesopause respectively.

The temperature variations in each layer are due to the way solar energy is absorbed as it moves downward through the atmosphere. The earth's surface is the primary absorber of solar energy. Some of this energy is reradiated by the earth as heat, which warms the overlying troposphere. The global average temperature in the troposphere rapidly decreases with altitude until the tropopause, the boundary between the troposphere and stratosphere.

Purpose

You will be able to discover how the atmosphere can be divided into layers based on temperature changes at different heights, by making a graph.

Materials

Ruler

Colored pencils

Calculator

Procedure

- 1) The data table contains the average temperature readings at various altitudes in the Earth's atmosphere. Plot the data on the graph and connect the adjacent points with a smooth curve.
- 2) Be careful to plot the negative temperature numbers correctly.
- 3) The profile should provide a general picture of the temperature at any given time and place. However, the actual temperature may deviate from the average values, particularly in the lower atmosphere.
- 4) Complete the analysis & conclusion questions
- 5) When finished, please turn in your lab!

Data Table

Altitude (km)	Temp (°C)
0	15
5	-18
10	-49
12	-56
20	-56
25	-51
30	-46
35	-37
40	-22
45	-8
48	-2

Altitude (km)	Temp (°C)
52	-2
55	-7
60	-17
65	-33
70	-54
75	-65
80	-79
84	-86
92	-86
95	-81
100	-72

Graph

Located on Last Page

Analysis & Conclusion Questions

- 1) Looking at your graph, what do scientists use as the basis for dividing the atmosphere into four layers?
- 2) Using the information in the lab introduction, **label and color the different layers** of the atmosphere and the separating boundaries between each layer:

Word Bank

troposphere	tropopause	stratosphere	stratopause	mesosphere	mesopause	thermosphere
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- 3) The ozone layer is located between the altitude of 20 and 50km. **Label the ozone layer on your graph.**
- 4) Does the temperature increase or decrease with altitude in the:
 - a. Troposphere _____
 - b. Mesosphere _____
 - c. Stratosphere _____
 - d. Thermosphere _____
- 5) What is the approximate height and temperature of the:

	Height (km)	Temperature(°C)
Tropopause		
Stratopause		
Mesopause		

- 6) What causes the temperature to increase with height through the stratosphere and decrease with height through the mesosphere? (refer to pages 273 to 274 of your textbook for a reference)
- 7) Referring to the introduction to the lab, what causes the temperature to decrease with height in the troposphere?

- 8) **Application to Mathematics:** Determining the rate of change in different layers of the atmosphere can be found by calculating the approximate slope of the line in that layer.

Recall: Slope = $\frac{\text{change in } y}{\text{change in } x}$ Slope = $\frac{\text{rise}}{\text{run}}$ Slope = $\frac{y_2 - y_1}{x_2 - x_1}$

Calculate the rate at which the temperature decreases in the troposphere:

9) ***BONUS***

A) Calculate the rate at which the temperature heats up in the stratosphere

B) Calculate the rate at which the temperature decreases in the mesosphere

C) Calculate the rate at which the temperature heats up in the thermosphere

Graph!

Layers of the Atmosphere

