

Name: _____

Density Lab

Objective:

I can show how altitude affects the density of the air.

Materials:

Beans (air molecules)	Triple beam balance/scale	Layers of the Atmosphere Data Sheet
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Problem: How does altitude affect the density of the air?

Hypothesis: If I increase the altitude, then the density of the air will _____

Experiment procedure:

1. Take the beans and put them end to end to create a circle around the inside of the *troposphere*.
2. Draw the beans in the troposphere on your lab diagram (make sure you have the correct number of beans in your diagram)
3. Using the same beans from step 1 (DO NOT ADD ANY MORE BEANS) evenly space the beans around the *stratosphere* and draw the location of those beans on your lab diagram
4. Repeat step 3 for the *mesosphere*, *thermosphere*, and *exosphere*
5. Take those beans (between 10-15 beans) and find the mass of those beans using a triple beam balance. Record the mass in your data table
6. Calculate the density of the air molecules (beans) using the formula:
$$\text{Density} = \text{mass/volume}$$
7. Using the same mass you found in step 4, calculate the density for the stratosphere, mesosphere, thermosphere, and exosphere.

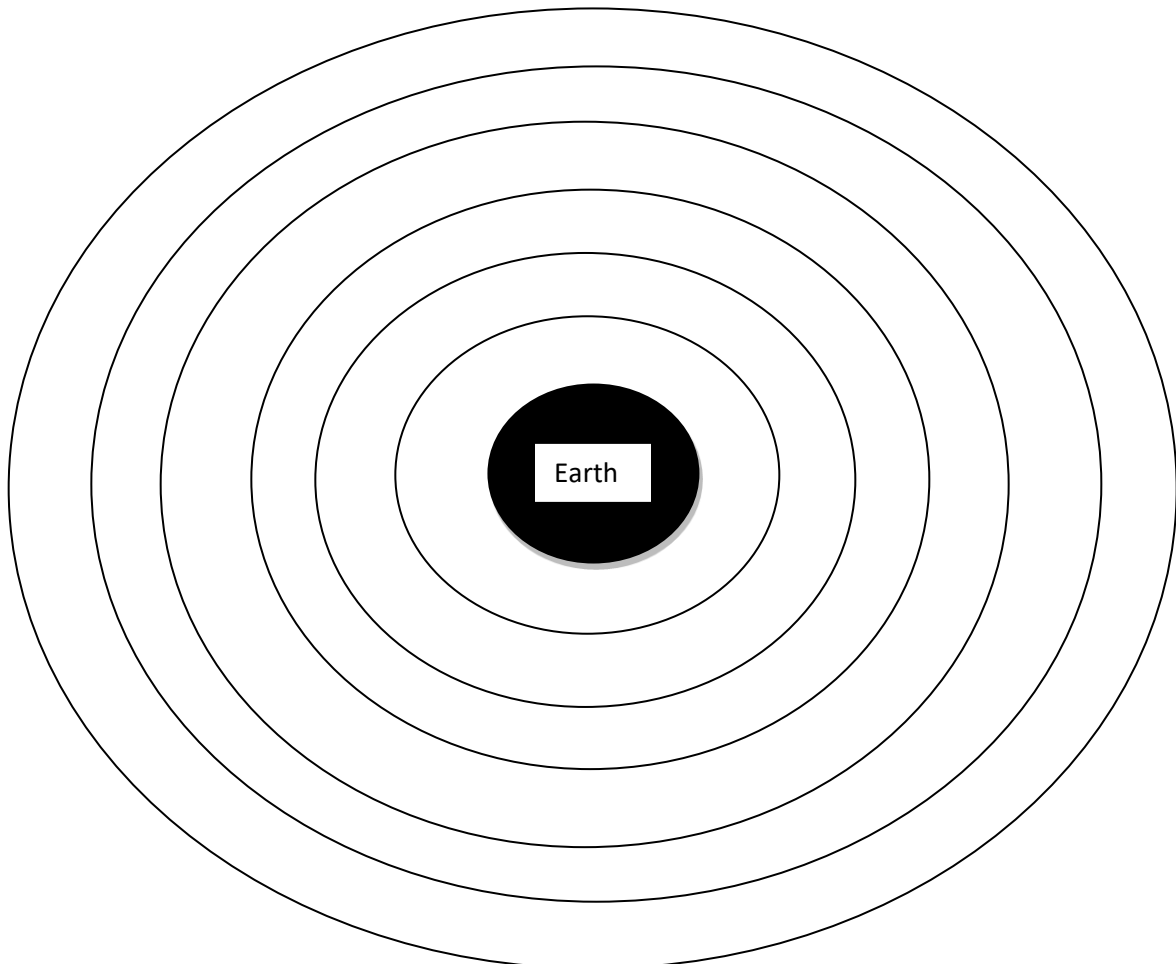
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Hypothesis: If I increase the altitude, then the density of the air will _____

Experiment Data:

Layer	Mass (grams)	Volume (cm ³)	Density $m/v = g/cm^3$ (round to the nearest thousandth)
Troposphere (T)		20.58 cm ³	
Stratosphere (S)		104.21 cm ³	
Mesosphere (M)		523.08 cm ³	
Thermosphere		724.73 cm ³	
Exosphere		1527.04 cm ³	

- Label the layers of the atmosphere
- Draw the air molecules (beans) in each layer of the atmosphere



Analyze Data: Create a bar graph (comparing) to show the densities of each layer

Title: _____

Y-Axis Label _____

.28					
.27					
.26					
.25					
.24					
.23					
.22					
.21					
.20					
.19					
.18					
.17					
.16					
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.07					
.06					
.05					
.04					
.03					
.02					
.01					
0					
	Troposphere	Stratosphere	Mesosphere	Thermosphere	Exosphere

X-Axis Label _____

Conclusion Questions: ANSWER IN COMPLETE SENTENCES!!!

1. What was the density in the troposphere? How does this density compare to the density in the other layers?
2. As altitude increases what happens to the density of the air? Use your density calculations to support your answer. (Example: The density of the air in the troposphere was 5.2 g/cm and increased in the mesosphere to 8.6g/cm)
3. What did you notice about the space in between the beans on your lab diagram of the layers of the atmosphere as altitude increases?
4. Explain the relationship between density of the air and altitude?
5. What layer has the lowest density? Explain why this layer has the lowest density.