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 |

**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. 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
4. Calculate the density of the air molecules (beans) using the formula:

Density = mass/volume

1. 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
2. Repeat step 5 for the mesosphere, thermosphere, and exosphere
3. Using the same mass you found in step 4, calculate the density for the stratosphere, mesosphere, thermosphere, and exosphere.

**Density Lab**

**Hypothesis:** If I increase the altitude, then the density of the air will \_\_\_\_\_\_\_\_\_\_\_

**Experiment Data:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Layer** | **Mass (grams)** | **Volume (cm3)** | **Density m/v = g/cm3**  **(round to the nearest thousandth)** |
| Troposphere (T) |  | **20.58 cm3** |  |
| Stratosphere (S) |  | **104.21 cm3** |  |
| Mesosphere (M) |  | **523.08 cm3** |  |
| Thermosphere |  | **724.73 cm3** |  |
| Exosphere |  | **1527.04 cm3** |  |

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

Earth

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

**Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **0** |  |  |  |  |  |
|  | **Troposphere** | **Stratosphere** | **Mesosphere** | **Thermosphere** | **Exosphere** |

Y-Axis Label: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**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 increased?
4. Explain the relationship between density of the air and altitude?

1. What layer has the lowest density? Explain why this layer has the lowest density.