Directions: READ the passage below.

The Structure of Earth’s Atmosphere

Up in the night sky, a “shooting star,” or meteor, may burn up as it passes through the atmosphere. How does the atmosphere differ between where a shooting star burns and where you stand?

The properties of the atmosphere differ in three main ways, depending on altitude. As it extends upward, its composition, the distance between its particles, and its temperature all change. These characteristics are used to divide it into layers, as shown in Figure 3.

The layer of the atmosphere that is closest to Earth’s surface and the layer where weather occurs is called the troposphere. The troposphere is where people live as well. It is the thinnest of the atmospheric layers at about 10 km (6.2 mi) and can vary in thickness from 6–20 km (3.7–12.4 mi).

The layer of the atmosphere above the troposphere is called the stratosphere. The stratosphere has very little water vapor, but it has more ozone than any other layer. Ozone is a gas that absorbs certain harmful high-energy waves given off by the sun.

The mesosphere is the layer above the stratosphere. It is the coldest layer of the atmosphere, with a high temperature of only about −15°C (5°F). Although the particles of air in the mesosphere are farther apart than in the stratosphere, they are close enough to make meteors burn and leave blazing trails.

The thermosphere is the layer above the mesosphere and has relatively few air particles, which are very far apart but are very energetic. The temperature near the top of this layer is extremely hot—up to 2,000°C (3,632°F)! Satellites and the International Space Station orbit in the thermosphere.

The exosphere is the very top layer of the atmosphere that blends gradually into space and does not have a clear outer edge. The particles of air in the exosphere are extremely far apart.
1. Identify each of the five major layers of Earth’s atmosphere, from the ground up.

5. ________________________________________
4. ________________________________________
3. ________________________________________
2. ________________________________________
1. ________________________________________

2. Which of the layers of the atmosphere is the thinnest?

________________________________________________________________________________

________________________________________________________________________________

3. In which layer of the atmosphere does most of Earth’s weather occur?

________________________________________________________________________________

________________________________________________________________________________

Back in school, when we studied the layers of Earth’s atmosphere, there were two main variables we looked at: temperature and density. As you ascend in altitude through Earth’s atmosphere, meaning the higher distance above sea level you are traveling, you will notice drastic changes in the temperature and density of each of the layers of Earth’s atmosphere.

On the next page, you will analyze a data table and a line graph depicting temperature and density data for each of Earth’s atmospheric layers. Using the data table and the line graph, you will answer questions comparing these two variables. Please note that data for the exosphere is not on the line graph. This is because data for the exosphere is so extreme that it does not fit on the graph.
# Temperature and Density of Earth’s Atmospheric Layers

<table>
<thead>
<tr>
<th>Atmospheric Layer</th>
<th>Altitude Above Sea Level (km)</th>
<th>Temperature (°C)</th>
<th>Density (kg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exosphere</td>
<td>1,000</td>
<td>0 to over 1,700</td>
<td>0.00</td>
</tr>
<tr>
<td>Thermosphere</td>
<td>690</td>
<td>2,000</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>80</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>110</td>
<td>-27</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>-75</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>-90</td>
<td>0.00</td>
</tr>
<tr>
<td>Mesosphere</td>
<td>85</td>
<td>-90</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>-53</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>-25</td>
<td>0.00</td>
</tr>
<tr>
<td>Stratosphere</td>
<td>50</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>-42</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>-55</td>
<td>0.08</td>
</tr>
<tr>
<td>Troposphere</td>
<td>11</td>
<td>-55</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>-17</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>17</td>
<td>1.25</td>
</tr>
</tbody>
</table>
4. In which layer(s) of the atmosphere does temperature steadily decrease with altitude? In which layer(s) does it increase? *Notice the data in the table and graph. I can see the lines moving in one graph and the numbers in the other. In the Troposphere and Mesosphere, as the altitude gets higher, the temperatures keep going farther into the negatives. This means the temperature is getting colder. In the Stratosphere and Thermosphere, as the altitude gets higher, the temperatures rise back up toward the positive range. This means the temperature is getting warmer.*

<table>
<thead>
<tr>
<th>Layer(s) Where Temperature Decreases with Increasing Altitude</th>
<th>Layer(s) Where Temperature Increases with Increasing Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troposphere, Mesosphere</td>
<td>Stratosphere, Thermosphere</td>
</tr>
</tbody>
</table>

5. Based on the graph, how does the *density* of the atmosphere vary with altitude? (*The altitude numbers are on the side of the graph. The density line is blue.*)

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