

Picturing the Atmosphere

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1. Choose one end of the receipt tape to be the Earth's surface. Draw a straight line across the bottom of the tape **1 inch from the bottom**. This line represents sea level so write **Sea Level** just above the line. Write **Earth** on the very bottom of the page. **YOU WILL MAKE ALL YOUR MEASUREMENTS FROM THIS LINE NOT THE BOTTOM OF THE TAPE.**
2. The scale for your drawing will be 1 mile = 1 inch. Write **Scale: 1 inch = 1 mile** under the Sea Level line. This means that each inch upward from sea level on your drawing represents 1 mile of altitude in the real atmosphere. **Remember, the object's height in miles is its height in inches ABOVE the line you called sea level!!!**
3. **When you add each item to your picture, be sure to include the name of the item and how many miles above sea level each item is. Example: Airplane 9 miles.**
4. **Mount Everest:** The tallest land mountain in the world is Mount Everest which is 5 ½ miles high. Measure 5 ½ inches straight up from sea level and make a mark. That mark is the peak of Mount Everest. Draw in the rest of the mountain with the bottom of your Mount Everest going all the way down to your sea level line. Write **Mount Everest** and its miles next to your mountain.
5. **Thunderstorms:** A giant thunderstorm cloud can be seen several miles high. Rain falls from its flat base about 1 ½ miles up. The cumulonimbus cloud towers up to 9 ½ miles, where it flattens out as it bumps against the Stratosphere which gives the cloud its anvil shape. Draw a cloud that stretches from 1 ½ miles to 9 ½ miles and label your cloud **Thunderstorm** with its height. Yes, your cloud is going to look really weird, long and skinny and totally not like a normal cloud. This is okay. Just draw it like so and label it with its height next to the label.
6. **Airplanes:** Passenger jets can fly at an altitude of up about 9 miles. Draw a jet at 9 inches and label it **Airplane** and then add its height.
7. **Half Above – Half Below:** At the height of just 3 ½ miles, you are already above half the weight of the atmosphere. That's how much gravity compresses the air! Make a line all the way across your paper (through Mount Everest) at 3 ½ miles. Label your line like this:

Half Above

Half Below

8. **Mare's Tails:** Wispy cirrus clouds, or mare's tails, are very high up – between 6 and 8 miles. Unlike lumpy cumulus clouds, which are built from droplets of water, these clouds are composed of ice crystals. Draw some cirrus clouds that stretch from 6 to 8 miles and label them **Cirrus Clouds** making sure to add their height as well.
9. **Welcome to the Stratosphere:** Make another line across your tape at 10 miles. That's the end of the troposphere and the beginning of the stratosphere. Write **Stratosphere** above the line and **Troposphere** below the line:

Stratosphere

Troposphere

10. **Jet Stream:** The jet streams are wavy ribbons of fast-moving air. They usually occur between 10 and 15 miles up. Speeds of over 300 miles per hour have been recorded in jet streams, but usually winds are around 100 miles per hour. Jet streams affect Earth's weather, and are often associated with storms and tornadoes. **Draw a line across your paper and label the line Jet Stream** and then label the height.

11. **Ozone Layer:** The layer of ozone gas that protects us from the Sun's harmful ultraviolet light lies between 15 ½ and 22 miles up. Use a different color to represent this region. Color the entire region that color. Label the region **Ozone Layer** along with its height.
12. **Weather Balloon:** Weather balloons are instruments that collect information about the earth's atmosphere. Weather balloons carry instrument packages called radiosondes high into the atmosphere that gather essential upper-air data needed to forecast the weather. These instruments are launched twice a day at 1,100 sites around the world. Temperature, humidity and air pressure are measured at various altitudes and transmitted via radio waves to a receiving station. Weather balloons may reach altitudes of 25 miles or more. **Measure up 25 miles and draw a picture of a weather balloon** and then label the height.
13. **Welcome to the Mesosphere:** Draw a line straight across the tape at 30 miles. That's the end of the stratosphere. You are now entering the Mesosphere. Write **Mesosphere** above the line and **Stratosphere** below the line:

Mesosphere

Stratosphere

14. **Home of the Meteors:** This is the home of the meteors and bright streaks you often see at night. These "shooting stars" actually are small particles from space that have entered the atmosphere. They usually burn up between 35 and 45 miles up. Label this region **Meteors**.
15. **Now entering the Thermosphere:** Draw a line straight across the tape at 50 miles. That's the end of the Mesosphere. You are now entering the Thermosphere. This is the last layer of the atmosphere. By the time you get this high up there isn't enough air around to bother counting the molecules. Write **Thermosphere** above the line and **Mesosphere** below the line:

Thermosphere

Mesosphere

16. **Goodbye air, hello space:** The lower boundary of space is usually set at 50 miles, so **draw a small space shuttle or astronaut** above your Thermosphere line. (Actually, the shuttle orbits about 170 miles up so you would have to add a lot more paper to put it in the correct place). Label the area above the space shuttle or astronaut **Space**, being sure to label the height.
17. **Aurora Borealis:** The bright dancing lights of the aurora are actually collisions between electrically charged particles from the sun that enter the earth's atmosphere. The lights are seen above the magnetic poles of the northern and southern hemispheres. They are known as 'Aurora borealis' in the north and 'Aurora australis' in the south. The displays appear in many colors although pale green and pink are the most common. Variations in color are due to the type of gas particles that are colliding. The most common aurora is produced by oxygen molecules located about 60 miles above the earth. Rare, all-red auroras are produced by high-altitude oxygen, at heights of up to 200 miles. Measure 60 miles up and **draw swirls of color**. **Label the swirls Northern Lights** and add the height to your tape.
18. Put your names on the back of your recipe tape and be prepared to share what you learned, found interesting and what you want to know more about.