

Layers of the Atmosphere Instructions

Name _____ Per _____

You will construct a paper model of the layers & characteristics of the earth's atmosphere. Follow the instructions line by line, check off each box when completed. Neatness and accuracy count; take your time.

1. In GREEN, at 0 km, draw a horizontal line for the earth's surface across the entire page. Label it "Earth's surface" in GREEN on the line.

2. Troposphere

- a. In PURPLE, draw a horizontal line across the entire page at 16 km. This is the top of the first layer of the atmosphere, just above the earth's surface.
- b. In BLACK, label this layer the "Troposphere".
- c. Most clouds are in this layer, so draw a couple of clouds and color the rest of the Troposphere layer LIGHT BLUE.
- d. Commercial airlines fly at an altitude of 10 km. Draw an airplane at 10 km.
- e. Mount Everest, the highest mountain on earth, is about 9 km tall. In BROWN, draw a mountain up to 9 km and label it "Mt. Everest".
- f. In BLUE, draw raindrops to show weather. This is the layer in which most weather happens.
- g. In PENCIL, label H₂O and CO₂ to show that most of the water vapor and carbon dioxide are in this layer. This layer has the most molecular mass and is the closest to the earth.
- h. In BLACK, label this layer the "most dense".

3. Stratosphere

- a. In RED, draw a horizontal line across the entire page at 50 km. This is the top of the second layer of the atmosphere.
- b. In BLACK, label this layer (from 16 to 50 km) the "Stratosphere".
- c. In PURPLE, just above the 16 Km line, label the "Jet Stream Winds". The Jet Stream has strong winds that can blow up to 200 miles per hour and lies between the Troposphere & Stratosphere.
- d. In Pencil, draw two horizontal dotted lines across the entire page, one at 30 km and one at 60 km. Label this area "ozone layer" and "UV absorbed". Put RED dots in this area to show that UV light is absorbed in the ozone layer.
- e. In PENCIL draw a hole in the ozone layer (a circle). Erase (or X out) some of the red dots in your CFC hole. Write in the words "CFC hole" to show how some of the ozone layer is being depleted by carbon chemicals called CFC's that come from freon gas in refrigerators and air conditioners.
- f. High altitude jets fly at about 20 km. Draw a jet at 20 km.

4. Mesosphere

- a. In ORANGE, draw a horizontal line across the entire page at 85 km. This is the top of the third layer of the atmosphere.
- b. In BLACK, label this layer (from 50 to 85 km) the "Mesosphere".
- c. Meteors are visible from earth because they burn up in this layer of gases. Draw a few small meteors at the top of the mesosphere (about 85 km).

5. Thermosphere

- a. The top layer of the atmosphere, from 85 km to about 1000 km, is called the "Thermosphere". In BLACK, label this layer "Thermosphere." Underline in RED "therm" in "Thermosphere". "Therm" is the root word for heat.
- b. In BLACK, label this layer "least dense". Pressure is very low here because there are not many gas molecules.
- c. In RED, write "heats up to 3600 °F" in this layer to show its temperature.

- d. Draw a vertical line along the scale side of your picture from 85 km to 550 km. Label this area in BLACK, writing vertically "ionosphere". This area has ions from the sun and these help to transmit radio communication by bouncing radio waves off this layer.
- e. The region above the ionosphere (higher than 550 km) is called the "exosphere". Label this area in BLACK, writing vertically.
- f. Aurorae occur between 90 km and 300 km due to the interaction of solar winds with the ionosphere. Draw an aurora and label it.
- g. Space shuttles orbit between 250 km and 300 km. Draw a space shuttle and label it.
- h. Communication satellites orbit the earth at about 300 km. Draw a satellite and label it.
- i. Weather satellites orbit at 850 km. Draw another satellite and label it.

6. Air Pressure

- a. Now in PENCIL, draw an arrow from the top of the atmosphere to the earth's surface. The arrow should be pointing towards the earth's surface.
- b. In BLUE, label this arrow "Pressure Increasing" to show how pressure gets higher as you get closer to the earth's surface. Label where pressure is "high" and "low" in PENCIL.

Altitude (km)	Temperature (°C)
0	15
10	-60
20	-60
30	-40
45	0
55	0
80	-90
90	-90
1000	40

7. Temperature

- a. The temperature changes in each layer of the atmosphere. The table here shows approximate temperatures at various altitudes. In PENCIL, plot these points on your graph. Do not connect the lines yet, just plot the points.
- b. Start at the bottom of the atmosphere and work your way up.
 - If the temperature at the next higher point is *lower*, then connect those two points with a BLUE line, to indicate decreasing temperature.
 - If the temperature at the next higher point is *higher*, then connect those two points with a RED line, to indicate increasing temperature.
 - If the temperature at the next higher point is *the same*, then connect those two points with a PENCIL line.
- c. The temperature of the thermosphere actually gets much higher than you can plot on this graph. At the end of your last temperature line (at 1000 km and 40 °C), draw an arrowhead pointing up and to the right to indicate that the temperature keeps increasing off the chart.

Interesting facts:

- Alan Shepard was launched into outer space May 5, 1961 from Cape Canaveral. He was the first U. S. person into space and was only there 15 minutes at 186 km altitude.
- Skylab (launched May 14, 1973) was a 100-ton research ship orbiting at 435 km altitude.
- Geosynchronous communication satellites (like for DirecTV or Dish Network) orbit at more than 35,000 km.