

How do meteorologists define the layers of the atmosphere?

from American Geological Institute

You are going to graph the temperature of the atmosphere at altitudes above Earth.
Connect the dots as you go.

Altitude (km)	Temperature (degrees C)	Altitude (km)	Temperature (degrees C)
0	15	52	-2
5	-18	55	-7
10	-49	60	-17
12	-56	65	-33
20	-56	70	-54
25	-51	75	-65
30	-46	80	-79
35	-37	84	-86
40	-22	92	-86
45	-8	95	-81
48	-2	100	-72

Label the layers of the atmosphere: troposphere, stratosphere, mesosphere, thermosphere.

1. How did meteorologists define the layers of the atmosphere?

2. Does the temperature increase or decrease in the troposphere?

Increase/decrease in the stratosphere?

Increase/decrease in the mesosphere?

Increase/decrease in the thermosphere?

3. What is the approximate depth (km) of the troposphere?

of the stratosphere?

of the mesosphere?

of the thermosphere?

4. What causes the temperature to increase with altitude through the stratosphere?

5. What causes the temperature to decrease with altitude through the mesosphere?

6. A jet to Honolulu cruises at 11 km altitude. Is it correctly drawn on the graph?

Would the inside of the jet to Honolulu be heated or air-conditioned when flying at cruising altitude?

7. Mount Everest is incorrectly drawn on the graph. National Geographic measured its altitude recently and found it to be 8.8 km. Draw Mt. Everest correctly on the graph. What would be the average temperature on Mt. Everest be, according to the graph?

8. Would a satellite orbiting at an altitude of 50 km need to be heated or air-conditioned?

9. During thunderstorms you can see lightning flash between clouds or from cloud to the ground. These clouds can be as high as 18 km. However, there was another kind of lightning that pilots talked about seeing, but no one believed them. The pilots said this weird lightning flashed from clouds up into space. Since no one had photos of this weird lightning, scientists thought the pilots were experiencing oxygen-deprivation. Then about ten years ago, one scientist specifically set out to photograph high-altitude lightning using special film. He became famous because he captured the images of red-sprites and blue jets, one-second lightning flashes which begin in thunderheads at 15 km and reach up to 90 km. Compare the lengths of the two kinds of lightning. Is it possible that this high-altitude lightning is what some people call flying saucers?

10. A record was set in 1998 when a propeller-driven airplane flew at the highest altitude ever: 24 km.

Wilber Wright set a record in 1903 when he was the very first person to fly in a propeller-driven airplane: at 4 meters which on the graph is 0.004 km. Draw one of these airplanes on the graph.

11. In which layer of the atmosphere is our weather and climate located?

12. How do meteorologists define the layers of the atmosphere?

Name

Class

Date

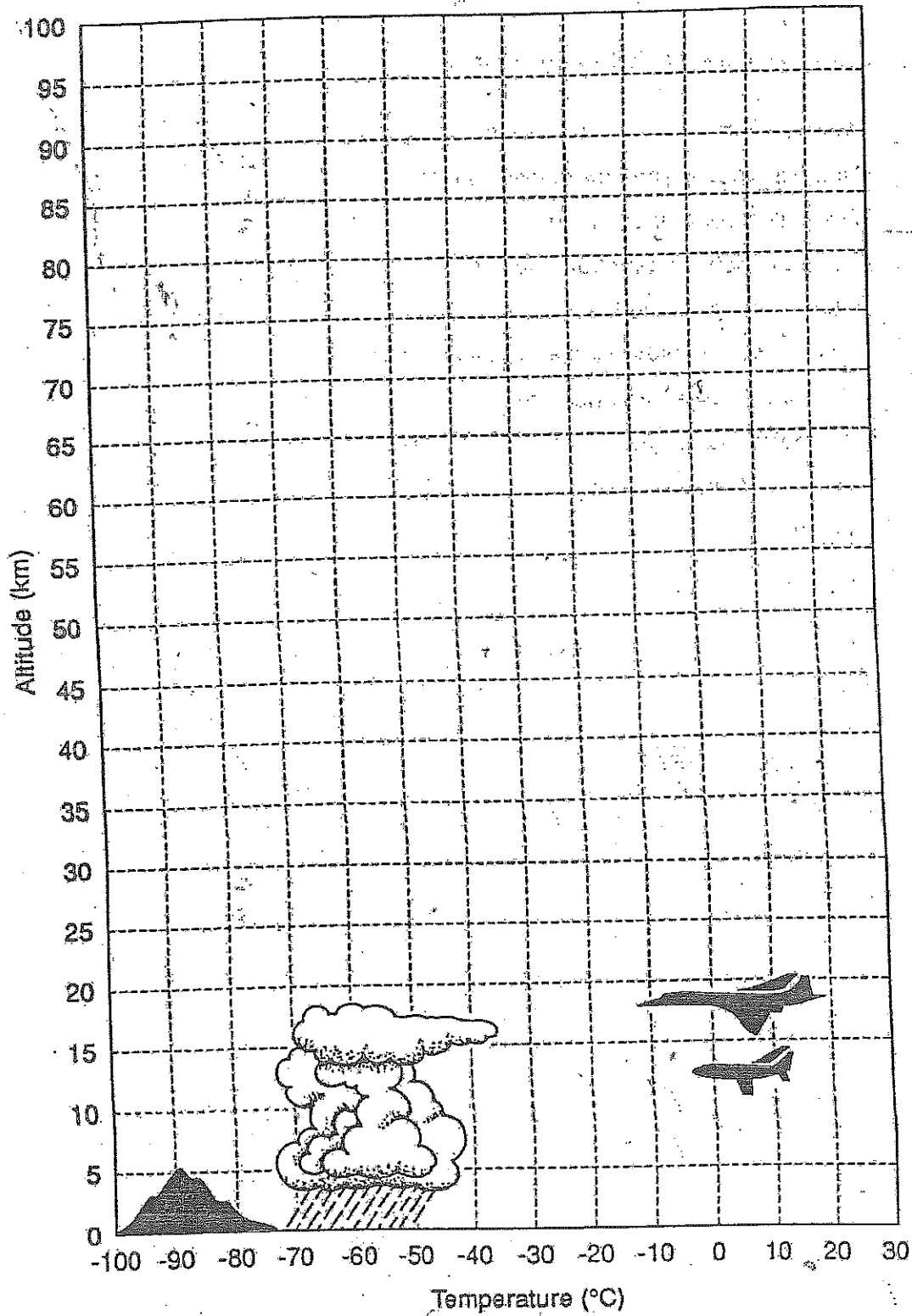


Figure 1. Graph of temperature at various altitudes.

