

LAYERS OF THE ATMOSPHERE

OBJECTIVE:

To discover how the atmosphere can be divided into layers based on temperature changes at different heights, by making a graph. To discover how air pressure is affected as the altitude increases.

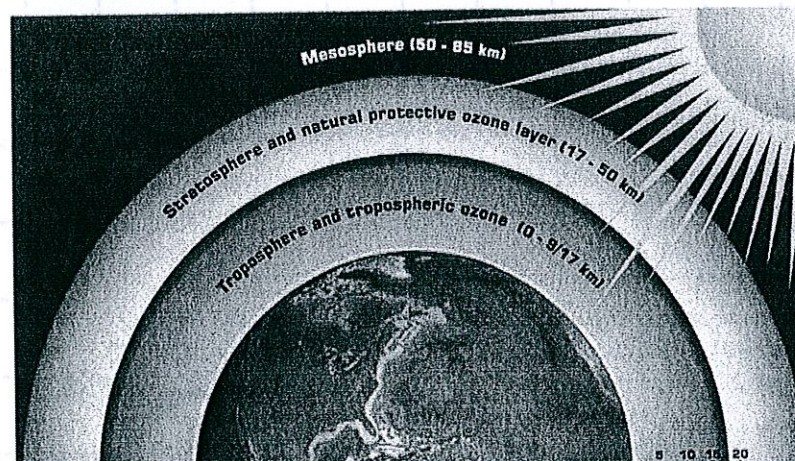
BACKGROUND INFO.:

The atmosphere can be divided into four layers based on temperature variations. The layer closest to the Earth is called the Troposphere. Above this layer is the Stratosphere, followed by the Mesosphere, then the Thermosphere. The upper boundaries between these layers are known as the tropopause, the stratopause, and the mesopause, respectively.

Temperature variations in the four layers are due to the way solar energy is absorbed as it moves downward through the atmosphere. The Earth's surface is the primary absorber of solar energy. Some of this energy is reradiated by the Earth as heat, which warms the overlying troposphere. The global average temperature in the troposphere rapidly decreases with altitude until the tropopause, the boundary between the troposphere and the stratosphere.

The temperature begins to increase with altitude in the stratosphere. This warming is caused by a form of oxygen called ozone (O_3) absorbing ultraviolet radiation from the sun. Ozone protects us from most of the sun's UV radiation, which can cause cancer, genetic mutations, and sunburn. Scientists are concerned that human activity is contributing to a decrease in stratospheric ozone. Nitric oxide, which is in the exhaust of high-flying jets, and chlorofluorocarbons (CFC's), which are used as refrigerators, may contribute to ozone depletion.

At the Stratosphere, the temperature stops increasing with altitude. The overlying Mesosphere does not absorb solar radiation, so the temperature decreases with altitude. At the mesopause, the temperature begins to increase with altitude, and this trend continues in the Thermosphere. Because the atmosphere is so thin, a thermometer cannot measure the temperature accurately, and special instruments are needed.



Name.....
 Class.....
 Date.....

Layers of the Atmosphere

Worksheet

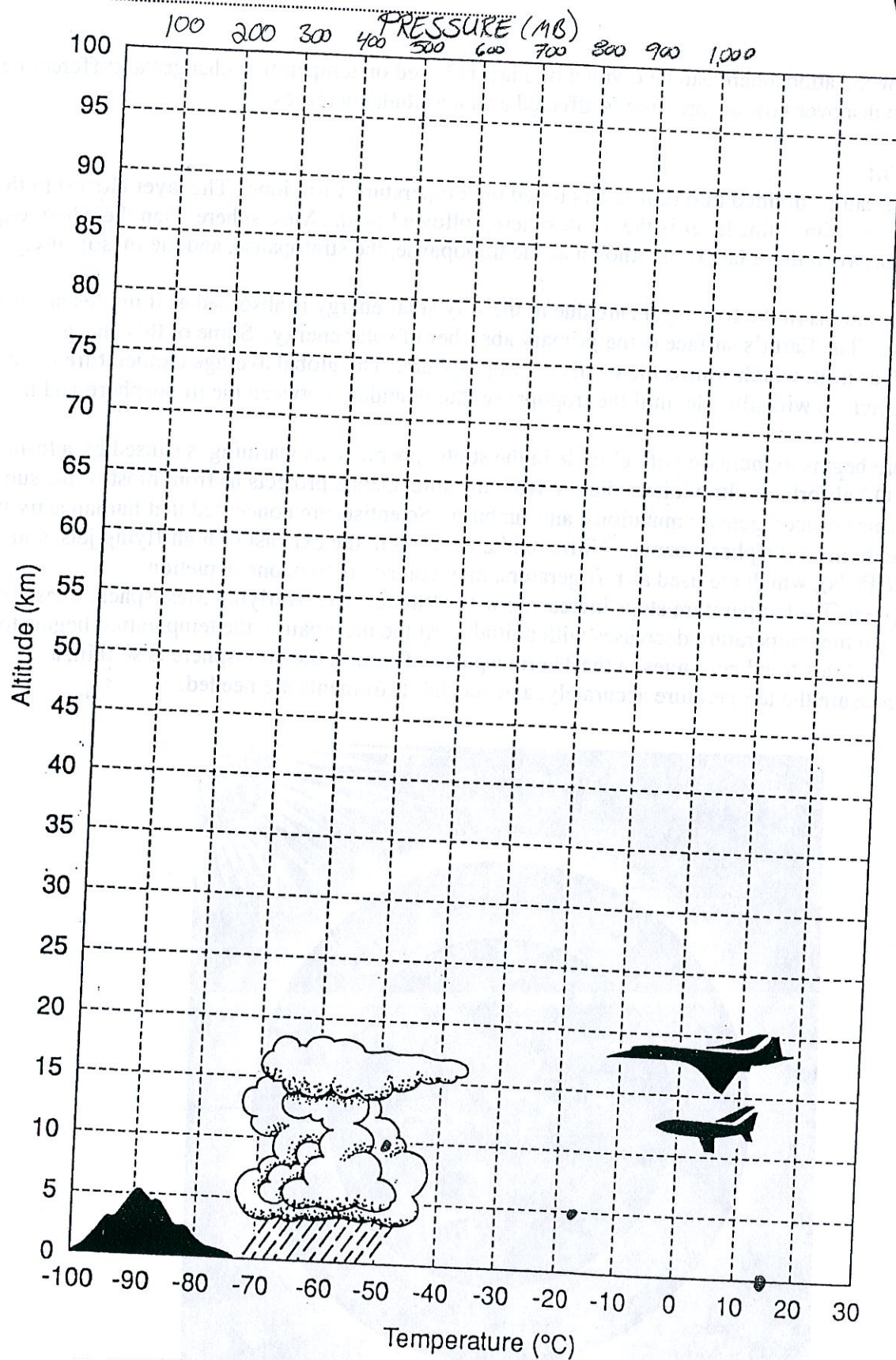


Figure 1. Graph of temperature at various altitudes.

ALTITUDE Height (km)	TEMPERATURE (Celcius)
0	15
5	-18
10	-49
12	-56
20	-56
25	-51
30	-46
35	-37
40	-22
45	-8
48	-2
52	-2
55	-7
60	-17
65	-33
70	-54
75	-65
80	-79
84	-86
92	-86
95	-81
100	-71

ALTITUDE Height (km)	PRESSURE (mb)
0	1013.2
0.5	954.6
1	898.8
1.5	845.6
2	795
2.5	746.9
3	701.2
3.5	657.8
4	616.6
5	540.4
6	472.2
7	411
8	356.5
9	308
10	265
12	194
14	141.7
16	103.5
18	75.65
20	55.29
25	25.49
30	11.97
35	5.75
40	2.87
50	0.798

PROCEDURE:

1. The tables above contain average temperature and pressure readings at various altitudes in the Earth's Atmosphere. Plot this data on the graph (provided), and connect the adjacent points with solid lines. This profile provides a general picture of temperature and pressure conditions in the atmosphere; at any given time and place, however, the actual temperature may deviate from the average values, particularly in the lower atmosphere.
2. Label the different layers of the atmosphere and the separating boundaries between each layer.
3. Mark the general location of the ozone layer.

QUESTIONS:

1. What is the basis for dividing the atmosphere into four layers?

2. Does the temperature increase or decrease with altitude in the:

troposphere? _____

stratosphere? _____

mesosphere? _____

thermosphere? _____

3. What is the approximate height and temperature of the:

tropopause: _____

stratopause: _____

mesopause: _____

4. What causes the temperature to increase with height through the stratosphere, and decrease with height through the mesosphere?

5. What causes the temperature to decrease with height in the troposphere?