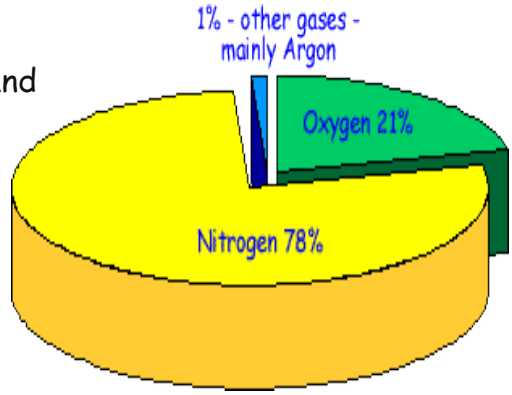
Student Sheet 1

CRITICAL THINKING ACTIVITY:
MODELING EARTH'S ATMOSPHERIC LAYERS

The Earth is surrounded by the ***atmosphere***, a body of air or gasses that protects the planet and enables life to exist. Most of our atmosphere is located close to the earth's surface where it is most dense. The air of our planet is 79% nitrogen and just under 21% oxygen; the small amount remaining is composed of carbon dioxide and other gases.



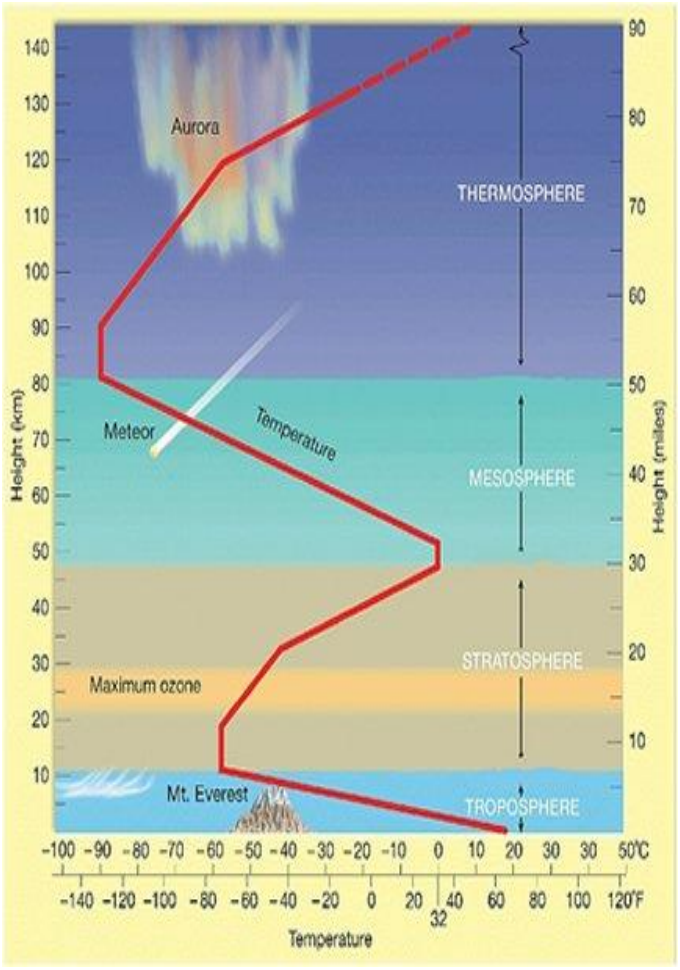
There are five distinct layers of the Earth's atmosphere:

Troposphere:

The layer of the atmosphere closest to the Earth is the troposphere. This layer is where weather occurs. It begins at the surface of the earth and extends out to about 4- 12 miles. The temperature of the troposphere decreases with height. This layer is known as the lower atmosphere.

Stratosphere:

Above the troposphere is the stratosphere, which extends to about 30-35 miles above the earth's surface. Temperature rises within the stratosphere but still remains well below freezing. Jet streams occur here, which are fast moving currents of air between the 2 layers.



Student Sheet 2

- **Mesosphere:**
  From about 35 to 50 miles above the surface of the earth lies the mesosphere, where the air is especially thin and molecules are great distances apart. Temperatures in the mesosphere reach a low of -184°F (-120°C). It is the coldest layer of the atmosphere. Radio waves are reflected to Earth and meteors burn up in this layer. The stratosphere and the mesosphere are the middle atmosphere.

- **Thermosphere:**
  The thermosphere rises several hundred miles above the earth's surface, from 50 miles up to about 400 miles. Temperature increases with height and can rise to as high as 3,600°F (2000°C). Nonetheless, the air would feel cold because the hot molecules are so far apart. This layer is known as the upper atmosphere.

- **Exosphere:** Extending from the top of the thermosphere to 6200 miles (10,000 km) above the earth is the exosphere. This layer has very few atmospheric molecules, which can escape into space. When meteoroids enter Earth's atmosphere, they enter through the exosphere, which is extremely hot. Because of the heat, most meteoroids burn up.

Between each layer of the atmosphere is a boundary. Above the troposphere is the ***tropopause***; above the stratosphere is the ***stratopause***; above the mesosphere is the ***mesopause***; and above the thermosphere is the ***thermopause***. At these "pauses," maximum changes between the "spheres" occur.

COMPREHENSION QUESTIONS:

1. If the atmosphere is so big, why do planes primarily operate in the Troposphere?
2. Describe the types of vehicles that could be found in each layer of the atmosphere.
3. Where do you think Earth-observing satellites orbit? What determines their orbital altitude?
4. Why do you think the Hubble Space Telescope orbits in the Exosphere?
5. Explain what happens to the atmospheric pressure and temperature as altitude increases.
6. Identify the different forms that water takes as altitude increases. (surface to the upper troposphere)
7. Explain why pilots must wear special suits when flying in the upper atmosphere.
8. What pollutant from the surface manages to reach the stratosphere? Predict where this material comes from.