

20.4 ENRICHMENT WORKSHEET **INTEGRATING** **PHYSICS**
The Tropopause

Read the following paragraphs, and complete the exercises below.

The layer of the atmosphere closest to Earth's surface is called the *troposphere*. Within this layer, the temperature decreases as you go to higher altitudes. At the top of the troposphere, the temperature levels off at a boundary called the *tropopause*.

The tropopause is located about 15 to 20 km above Earth's surface at the equator and about 10 km above the surface at the poles. Why is there such an extreme difference between the altitude of the tropopause at the equator and at the poles?

Much of the movement of air in the troposphere is caused by *convection*. In convection, energy is transferred by the movement of a heated fluid, such as air or water. In this case, the air at the bottom of the troposphere is warmed by Earth's surface. The hot air is less dense than the cool air above it, so it rises.

The air cools as it rises until it reaches an equilibrium altitude at the tropopause. The hotter the air is to begin with, the further it must rise to become completely cooled. At the equator, the tropopause is higher in the atmosphere, because the air is generally warmer and therefore takes longer to cool. At the poles, where the air is not as warm, the tropopause is at a lower altitude.

Exercises

1. Above what atmospheric layer is the tropopause located?

2. Explain, in your own words, how energy is transferred through convection.

3. A stove applies heat only to the bottom of a pan, but all of the water in the pan gets warm. Can this be explained through convection? Explain in your answer.

4. If the average temperature at the equator and the poles increased, what would happen to the position of the tropopause? What would happen if the average temperatures decreased?

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