Weather Intro & Atmosphere

Week 14

C-notes

What is weather?

It is the set of conditions that exist in the atmosphere in a specific place and at a specific time

C-notes

What is weather?

Weather looks at three components in the atmosphere:

1. **Temperature (of the air)**
2. **Water in the air (water vapor, precipitation)**
3. **Movement of air (direction, strength of winds)**

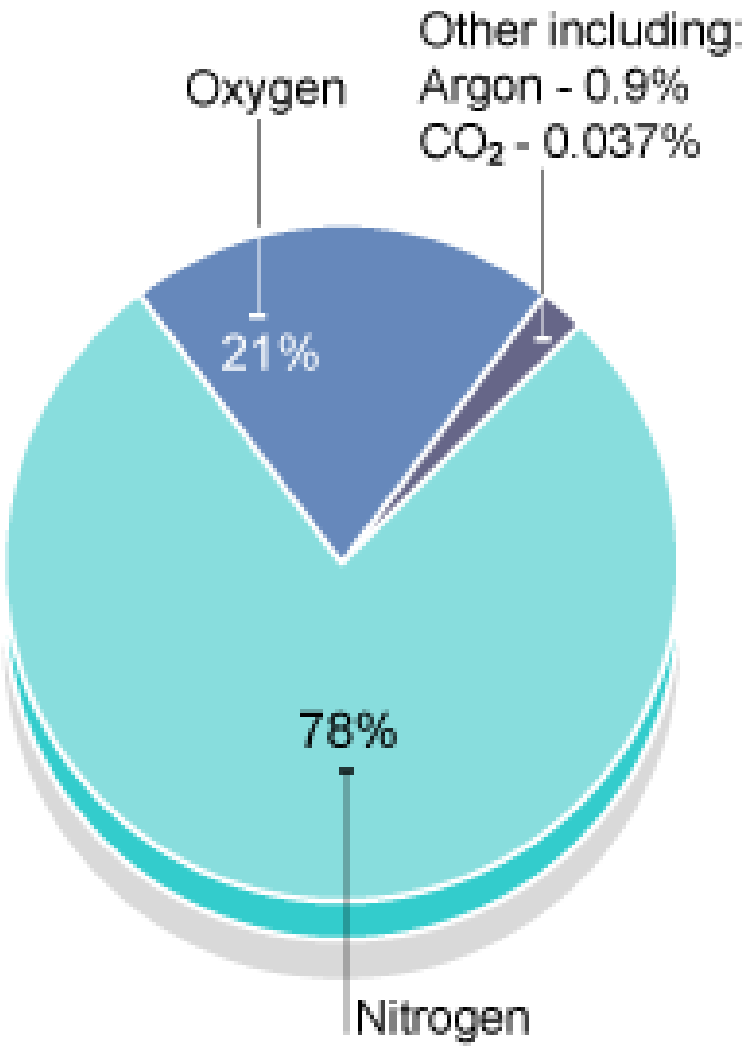
C-notes

What is the atmosphere?

It is the layer of gases that surrounds a planet.

Earth's Atmosphere has four basic layers (starting at Earth's Surface):

1. **Troposphere (where we live, planes fly, where "weather" happens)**
2. **Stratosphere (ozone layer)**
3. **Mesosphere**
4. **Thermosphere**



What is the Earth's Atmosphere made up of?

The atmosphere is a mixture of gases. Main gases are:

1. **Nitrogen 78%**
2. **Oxygen 21%**
3. **Other- 1%**

Other includes CO2, Argon and WATER VAPOR

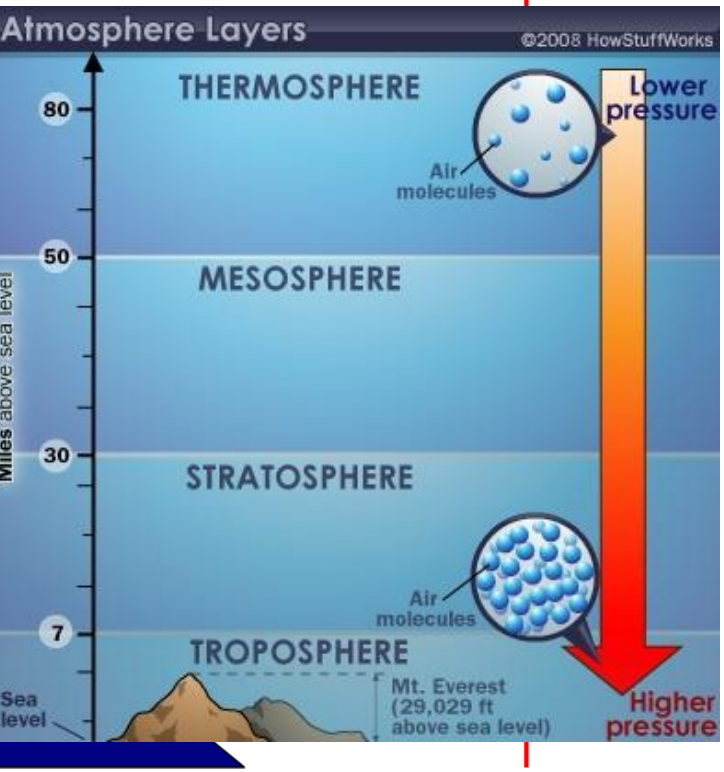
What is air pressure?

- Air pressure is the force of the air molecules pushing on a surface
- Right now, the air above you pushes on your skin…
- At sea level the force is 14.2 pounds on every square inch of your body

Characteristics of the Atmosphere

C-notes

**this is for the TROPOSPHERE



1. Temperature: **The higher up you go, the colder it gets.
2. **Pressure: the higher up you go, the less air molecules so there is less pressure.**
3. **Gases: there is less oxygen, the higher you go**

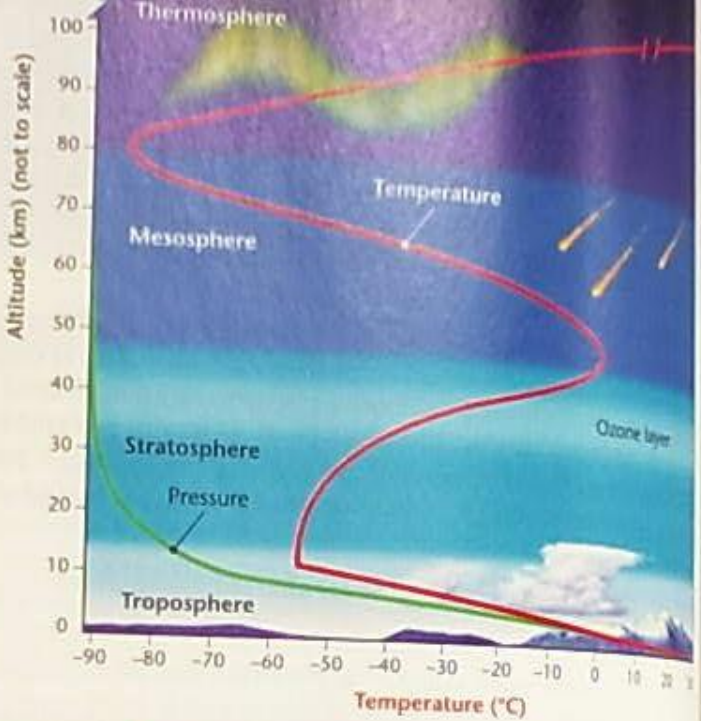


Figure 7 The red line indicates the temperature at various altitudes in the atmosphere. The green line indicates atmospheric pressure at various altitudes.

Layers of the Atmosphere

Earth's atmosphere has a distinctive pattern of temperature changes with increasing altitude, as shown in **Figure 7**. The temperature differences mainly result from how solar energy is absorbed as it moves through the atmosphere. Scientists identify four main layers of the atmosphere based on these differences.

The Troposphere

The atmospheric layer that is closest to Earth's surface and in which nearly all weather occurs is called the **troposphere**. Almost all the water vapor and carbon dioxide in the atmosphere is found in this layer. Temperature within the troposphere decreases as altitude increases because air in this layer is heated from below by thermal energy that radiates from Earth's surface. The temperature within the troposphere decreases at the average rate of 6.5 °C per kilometer as the distance from Earth's surface increases. However, at an average altitude of 12 km, the temperature stops decreasing. This zone is called the *tropopause* and represents the upper boundary of the troposphere. The altitude of this boundary varies with

troposphere the lowest layer of the atmosphere, in which temperature drops at a constant rate as altitude increases; the part of the atmosphere where weather conditions exist

in the stratosphere is heated by abso
ozone. The temperature of the air in
temperature of about 0 °C at an alti
Earth's surface. This zone, called the
boundary of the stratosphere.

The Mesosphere

Located above the stratopause an
about 80 km is the **mesosphere.** In this
as altitude increases. The upper bo
called the *mesopause*, has an average
which is the coldest temperature in
boundary, temperatures again begin

The Thermosphere

The atmospheric layer above th
thermosphere. In the thermosphere, t
as altitude increases because nitroge
solar radiation. Because air particles
far apart, they do not strike a thermom
an accurate temperature reading. Th
are needed. These instruments hav
more than 1,000 °C in the thermosphe

The lower region of the thermos
400 km, is commonly called the *ionosp*
radiation that is absorbed by atmosp
of gas molecules to lose electrons a
electrons. Interactions between solar
cause the phenomena known as *auro*
which are shown in **Figure 8.**

There are not enough data ab
temperature changes in the thermosph
to determine its upper boundary. Howev
above the ionosphere is the region wh
Earth's atmosphere blends into the alm
complete vacuum of space. This zone
indefinite altitude, called the *exosph*
extends for thousands of kilometers ab
the ionosphere.

Reading Check **What is the lowe
region of the thermosphere called?**

The Stratosphere

The layer of the atmosphere called the **stratosphere** extends from the tropopause to an altitude of nearly 50 km. Almost all the ozone in the atmosphere is concentrated in this layer. In the lower stratosphere, the temperature is almost –60 °C. In the upper stratosphere, the temperature increases as altitude increases because air in the stratosphere is heated by absorption of solar radiation by ozone. The temperature of the air in this layer rises steadily to a temperature of about 0 °C at an altitude of about 50 km above Earth's surface. This zone, called the *stratopause*, marks the upper boundary of the stratosphere.

stratosphere the layer of the atmosphere that lies between the troposphere and the mesosphere and in which temperature increases as altitude increases; contains the ozone layer

mesosphere the coldest layer of the atmosphere, between the stratosphere and the thermosphere, in which temperature decreases as altitude increases

thermosphere the uppermost layer of the atmosphere, in which temperature increases as altitude increases; includes the ionosphere

The Mesosphere

Located above the stratopause and extending to an altitude of about 80 km is the **mesosphere.** In this layer, temperature decreases as altitude increases. The upper boundary of the mesosphere, called the *mesopause*, has an average temperature of nearly –90 °C, which is the coldest temperature in the atmosphere. Above this boundary, temperatures again begin to increase.

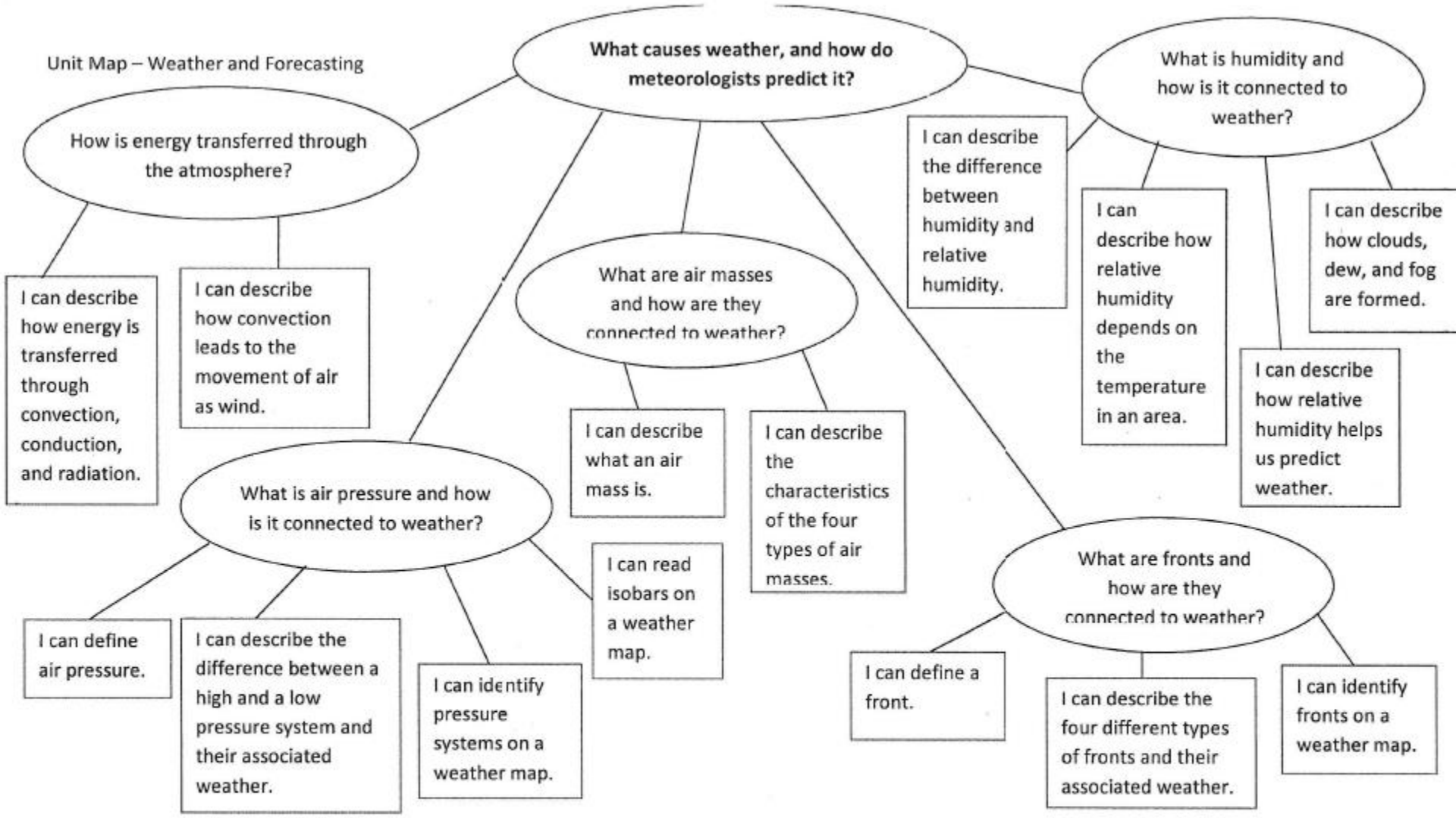
The Thermosphere

The atmospheric layer above the mesopause is called the **thermosphere.** In the thermosphere, temperature increases steadily as altitude increases because nitrogen and oxygen atoms absorb solar radiation. Because air particles in the thermosphere are very far apart, they do not strike a thermometer often enough to produce an accurate temperature reading. Therefore, special instruments are needed. These instruments have recorded temperatures of more than 1,000 °C in the thermosphere.

The lower region of the thermosphere, at an altitude of 80 to 400 km, is commonly called the *ionosphere*. In the ionosphere, solar radiation that is absorbed by atmospheric gases causes the atoms to produce ions and free

Figure 8 Auroras can be seen

Unit Map – Weather and Forecasting



Unit Vocabulary

barometer, isobar, air pressure, meteorologist
dew point, saturation, wind, air current
cold front, warm front, stationary front, occluded front
pressure system, humidity, relative humidity, air mass
cloud, dew, fog, convection
conduction, radiation, low-pressure system
high-pressure system

Other Important Vocabulary