

# Chapter 2

## Weather Patterns

### 2.1 The atmosphere's air pressure changes.

#### Air exerts pressure.

- \_\_\_\_\_ is the force of air molecules pushing on an area.
  - Air molecules move \_\_\_\_\_ and they bounce off every surface they hit.
  - As moving air molecules bounce off objects, they are exerting a force on that object.
  - The greater the force, the \_\_\_\_\_ the air pressure.
  - Air molecules move in all directions so air pressure pushes in \_\_\_\_\_ directions.

#### Air Pressure is related to altitude and density.

- Air pressure \_\_\_\_\_ as you move higher into the atmosphere.
  - Air pressure is equal to the \_\_\_\_\_ of the air pushing down.
  - At sea level there is more air pushing down than there is on top of a mountain.
  - At sea level air pressure is \_\_\_\_\_ than it is on top of a mountain.
- Air density \_\_\_\_\_ as you move higher into the atmosphere.
  - Air molecules are pushed \_\_\_\_\_ together (more dense) at sea level than they are on top of a mountain.

#### Pressure and Air Motion

- Air moves from areas of \_\_\_\_\_ pressure to areas of \_\_\_\_\_ pressure.

#### Barometers and Air Pressure

- A \_\_\_\_\_ is any instrument that measures air pressure.

### 2.2 The atmosphere has wind patterns.

#### Uneven heating causes air to move

- \_\_\_\_\_ is the condition of the earth's atmosphere at a particular time and place.
- \_\_\_\_\_ is air that moves horizontally or parallel to the ground.
  - Wind is an important part of weather.
- Air pressure can differ from place to place at the same altitude.
  - \_\_\_\_\_ heating of the earth's surface causes pressure differences.
  - Differences in air pressure set air in \_\_\_\_\_.
  - The larger the pressure difference the stronger the \_\_\_\_\_.
- Differences in air pressure cause \_\_\_\_\_.
  - Sunlight heats the ground, the ground heats the air, the warm air rises, and an area of \_\_\_\_\_ pressure forms.
  - Sunlight heats an area less strongly, the cooler dense air sinks slowly and an area of \_\_\_\_\_ pressure forms.
  - Global winds travel 1000's of kilometers in steady patterns and last for \_\_\_\_\_.
  - Uneven heating between the \_\_\_\_\_ and the north and south poles causes global winds.
  - Sunlight strikes the earth at the equator directly, resulting in \_\_\_\_\_ temperatures.
  - Sunlight is more spread out near the poles because it strikes the surface at an angle. The

# Chapter 2

## Weather Patterns

- air here is \_\_\_\_\_.
- The sinking of the cool air at the poles creates areas of \_\_\_\_\_ pressure that sets global winds in motion.

### Earth's Rotation affects wind rotation.

- If Earth did not rotate, global winds would flow directly from the \_\_\_\_\_ to the \_\_\_\_\_.
- The influence of earth's rotation is called the \_\_\_\_\_ Effect.
  - Global winds curve as the earth turns beneath them.
  - In the northern hemisphere, winds curve to the \_\_\_\_\_ in the direction of motion.
  - In the southern hemisphere, winds curve to the \_\_\_\_\_.
  - The Coriolis Effect is only noticeable for winds that travel \_\_\_\_\_ distances.
  - Because of the Coriolis Effect, global winds travel along \_\_\_\_\_ routes in each hemisphere.
  - These routes are called global wind belts.

### Bands of calm air separate wind belts.

- Earth's rotation and the uneven heating of its surface cause patterns of wind belts that are separated by \_\_\_\_\_ regions.

### Calm Regions

- Air rises at the doldrums, which are \_\_\_\_\_-pressure zones located near the equator.
  - The rising, moist air produces clouds and heavy rain. Sometimes, fueling tropical storms.
- Air sinks at the horse latitudes, which are \_\_\_\_\_-pressure zones located 30 degrees N and 30 degrees S of the equator.
  - Warm air leaving the equator cools and sinks in the horse latitudes. The area here is normally clear and dry.

### Wind Belts

- \_\_\_\_\_ - blow from east to west, moving from the horse latitudes to the equator.
- \_\_\_\_\_ - blow from west to east, moving from horse latitudes to the poles. They bring storms across much of the US
- \_\_\_\_\_ - blow from east to west, moving from the poles to the westerlies. Stormy weather occurs when the cold air of the easterlies meets the warm air of the westerlies.

### Effects of Wind on Travel

- \_\_\_\_\_ describes the condition when evaporation and condensation are equal. The amount of water vapor that the air can hold.
- \_\_\_\_\_ humidity compares the water vapor in the air to the amount of water vapor that can be present at a given temperature.
- \_\_\_\_\_ is the temperature at which air reaches saturation.

# Chapter 2

## Weather Patterns

### Characteristics of Clouds

- Clouds are made of condensed water vapor.
  - As warm air rises, it \_\_\_\_\_.
  - When the air cools to its dew point, water vapor condenses into tiny droplets or ice crystals. They either float as clouds on rising air or fall very slowly.
  - Water must condense on something solid so it condenses in the atmosphere on \_\_\_\_\_ Historically, sailors relied on global winds to travel across the Atlantic.
  - Sailors used to dread traveling the horse latitudes and \_\_\_\_\_ because they lacked the wind needed to move their ship

### Jet streams flow near the top of the troposphere.

- Jet streams are winds that flow in the upper \_\_\_\_\_ from west to east for thousands of kilometers.
  - Formed due to the uneven heating of earth's surface.
  - Air moves at \_\_\_\_\_ kilometers per hour
  - Jet Streams flow in a wavy pattern from west to east around the world.
  - They change positions throughout the year.
  - Effect of Jet Streams on air travel
  - Jet streams can lengthen or shorten airplane travel times.

### Patterns of heating and cooling cause local winds and monsoons.

- Local Winds
  - \_\_\_\_\_ breeze- during the day land heats up faster than water; as warm air rises over land, cool air rushes in from the ocean.
  - \_\_\_\_\_ breeze- land cools faster than water; as warm air rises over the ocean, cool air rushes in from land.
  - \_\_\_\_\_ breeze- heat and cool slower than mountain slopes; flow up mountain during the day.
  - \_\_\_\_\_ breeze- heat and cool faster than valley's; cool breeze flows into valley at night.
- Monsoons
  - Winds that change direction with the \_\_\_\_\_ are called Monsoons.
  - Caused by different heating and cooling rates of land and sea.
  - \_\_\_\_\_ monsoons- land becomes much cooler than the sea during winter, high pressure builds over land and cool, dry wind blows out toward sea.
  - \_\_\_\_\_ Monsoons- land warms faster than the sea, moist wind blows toward land, often bringing heavy rain.

### **2.3 Most clouds form as air rises and cools.**

#### Temperature affects water in the air.

- \_\_\_\_\_ is the process of liquid changing to a gas.
- \_\_\_\_\_ is the process of gas changing into a liquid.
- \_\_\_\_\_ is any type of water, liquid or solid, that falls to Earth's surface.

#### Humidity and Relative Humidity

- \_\_\_\_\_ is the amount of water vapor in the air.

# Chapter 2

## Weather Patterns

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- Clouds look different because they are formed under different \_\_\_\_\_.
- Shapes and sizes are determined by air movement. Composition of clouds is determined by location in the atmosphere.
- As altitude increases, temperature decreases. Clouds at high altitudes are made of tiny ice crystals. Clouds at low altitudes are made of water droplets.
- \_\_\_\_\_
- high altitudes
- Cold air
- appear feathery and wispy
- \_\_\_\_\_
- low altitudes
- puffy white clouds with dark bases
- growing taller provides showers; tallest cause thunderstorms
- \_\_\_\_\_
- Form at low altitude
- Form without strong air movement
- They can block out the sun
- Produce steady and light precipitation
- \_\_\_\_\_
- Fog is a cloud that rest on the ground or body of water
- Forms when surface is colder than air above it

### **2.4 Water falls to Earth's surface as precipitation.**

Precipitation forms from water droplets or ice crystals.

- All precipitation comes from \_\_\_\_\_.
- In order for precipitation to fall from a cloud to the Earth's surface, the droplets must become \_\_\_\_\_ enough to fall.
- It takes a \_\_\_\_\_ droplet to make a single raindrop.

Types of Precipitation.

- \_\_\_\_\_ - water that falls to the earth's surface as liquid
- \_\_\_\_\_ - rain that freezes as it hits the cold ground or other cold surface.
- \_\_\_\_\_ - rain that passes through a layer of cold air and freezes before reaching the ground.
- \_\_\_\_\_ - growing and merging ice crystals that falls through freezing air.
- \_\_\_\_\_ - lumps or balls of ice that fall from cumulonimbus clouds.

Precipitation can carry pollution.

- \_\_\_\_\_ rain is rain that becomes much more acidic than normal because of pollution.
- \_\_\_\_\_ combine with water vapor in the air and fall to the earth as precipitation.