Tuba Chishti

WEATHER UNIT REVIEW ☺

Weather is the set of environmental conditions encountered from day-to-day.
Weather is affected mainly by the atmosphere, the land forms and water in its various forms (solid, liquid and vapour).
Climate is the set of environmental conditions averaged over many years.

CHAPTER 13

- ★ The different seasons occur because of the Earth's tilt at 23.5°
- ★ The Tropic of Cancer at 23.5° N is the most northerly location reached by the Sun's vertical rays on the first day of summer. The most southerly location is Tropic of Capricorn
- ★ The Arctic Circle at 66.5° N is the most northerly location reached by the Sun's vertical rays on the first day of winter. The most southerly location is the Antarctic Circle.
- ★ Summer Solstice (longest day, shortest night): 21st June
- ★ Winter Solstice (longest night, shortest day): 21st December
- ★ Spring Equinox (equal day, equal night): 21st March
- ★ Autumn Equinox (equal day, equal night): 23rd September

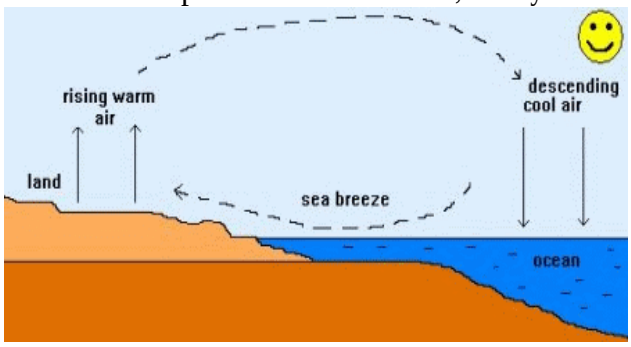
Energy Transfer

1. Radiation: The transfer of energy by means of waves. These waves travel through space, from the Sun to the Earth. Some of these lights are the UV light, infrared light and visible light.
2. Conduction: The transfer if energy through the collision of particles. Conduction generally occurs in metals and to a small extent on the Earth's surface. Different metals conduct heat at different rates.
3. Convection: The vertical transfer of energy by the movement of particles in a fluid.
4. Advection: The horizontal transfer of energy by the movement of particles in a fluid.

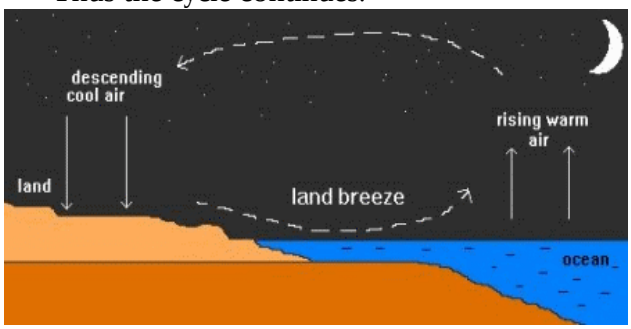
Reflection and Absorption of Energy

- ★ When the electromagnetic waves from the Sun reach the Earth, some are reflected back into space, and some are absorbed into the ground, atmosphere and the water bodies.
- ★ Any object or material that absorbs energy and becomes warmer is called a heat sink.
- ★ When solar energy hits water, the water begins to move (CONVECTION) and transfers energy hundreds of meters deep into the oceans.
- ★ Heat capacity is the measure of how much heat a substance or how much heat it releases as its temperature decreases.
- ★ Water has a higher heat capacity than sand (earth) and therefore, given the same amount of heat, sand heats up faster and cools of faster than water. This is the reason behind the land breeze and sea breeze effects (refer to Regional Weather).
    - During the day when the sun shines brightly on the beach, the sand heats up faster than the water does. The hot air over the sand rises into the atmosphere and begins cooling and starts settling above the water. In the meantime, the cool SEA

BREEZE from the water has moved to the low pressure vacuum above the sand and heat up and then rises. Thus, the cycle continues.



- At night, the sand cools off faster than the water. The hot air above the water rises and begins to cool, moving over the sand. The cool LAND BREEZE from the sand moves towards the low pressure vacuum above the water, heats up and rises. Thus the cycle continues.



The atmosphere

- ★ The atmosphere is a blanket of air and moisture that surrounds the Earth.
- ★ It is most dense at sea level, where the molecules are pressed together by the weight of the air above.
- ★ The Earth's atmosphere consists of 78% nitrogen, 21% oxygen and 1% other gases.

Atmospheric layers

- ★ Altitude/ elevation is the height above sea level.
- ★ All the layers are thicker above the equators than above the poles.
- ★ The troposphere is the layer closest to the Earth's surface.
- ★ It is about 8km thick above the poles and 16kms above the equator.
- ★ Where the troposphere ends is a thin boundary called the tropopause
- ★ The change of temperature over a distance is called a temperature gradient.
- ★ In the troposphere, the temperature gradient is -6°C, for every +1km
- ★ The higher the altitude, the lower the pressure
- ★ Pressures change across the surface of the Earth, and are called horizontal pressure gradients
- ★ Horizontal pressure gradients look like contour drawings
- ★ Windy conditions occur when the lines of the pressure gradients are closest together.

Prevailing Winds

- ☆ Winds that affect large areas are called prevailing winds
- ☆ The apparent change of direction of a moving object is called the Coriolis effect.
- ☆ Between 30° and 60° latitude, surface winds tend to flow from west to east. These are called the mid-latitude Westerlies. They affect Toronto and Mississauga.
- ☆ Jet streams are giant high-speed winds in the upper region of the troposphere. They tend to move from west to east and steer most of the major-weather systems, such as low-pressure and high-pressure gradients.
- ☆ Bernoulli's principle states that where the speed of a fluid is high, the pressure is low and where the speed of a fluid is low, the pressure is high.
- ☆ Fluids move from areas of high pressure to areas of low pressure.
- ☆ Prevailing winds are caused by a combination of convection currents and the Earth's eastward rotation.
- ☆ Prevailing winds help distribute large amounts of solar energy from the Equator to the colder parts of the world
- ☆ Since convection currents are involved in many of these winds, there is also a return flow of colder air southward
- ☆ The prevailing winds also carry moisture, helping to cause a variety of precipitation.

The hydrosphere

- ☆ All of the Earth's water forms the hydrosphere. (Remember that the biosphere is the part of the Earth where living things exist)
- ☆ Only about 2.5% of the Earth's water supplies are fresh water
- ☆ The water cycle is like grade 5 stuff, so if you don't know it, just go jump off some bridge.

Ocean Currents

- ☆ Warm water tends to travel from the Equator to the North or South Pole, and cold water tends to travel in the opposite direction.
- ☆ Close to a continent, ocean currents are forced to travel along its edge.
- ☆ Since the Earth rotates East, ocean currents on the west tend to be narrow and fast moving
- ☆ The oceans act as huge heat sinks because water has a high capacity to store heat. As water absorbs solar energy, it takes a long time to heat up. However, once it's warm, the water takes a long time to cool down again. These properties have an important effect on world climate and local weather.
- ☆ Ocean currents also affect the pressure of the air above them. For example, air above warm ocean currents becomes warmer and less dense, forming low-pressure systems

Clouds

- ☆ The most common cloud formation is a frontal cloud. It is formed when the front of a warm air moves over a cool air mass. In this case, the warm air rises, expands and cools so that the moisture in the in it condenses to form clouds.
- ☆ If enough warm, moist air travels far up in the troposphere, tiny ice pellets can form which creates friction with the air, creating static electricity.

Weather Systems

- ☆ An air mass is a large body of air in which the temperature and moisture content at a specific altitude are fairly uniform.

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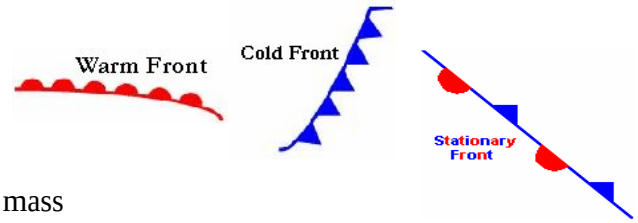

- ☆ A front is the leading edge of a moving air mass.
- ☆ The warm front is the leading edge of the warm air mass
- ☆ The cold front is the leading edge of the cold air mass
- ☆ A stationary front occurs when the boundary between a warm air mass and cold air mass remains fairly still.

Humidity

- ☆ Humidity is the measure of the amount of water vapour in the air
- ☆ Relative humidity is the measure of the amount of water vapour in the air as a percentage of the maximum amount of water vapour the air could hold at the temperature.
- ☆ Relative humidity=concentration/maximum concentration x 100

Dew Point

- ☆ The temperature at which dew forms
- ☆ As the temperature decreases, the air can not hold as much water and when the water condenses is the dew point
- ☆ This happens when the air is fully saturated.