



**Atmosphere** is the blanket of air and moisture that surrounds the earth

**Air** refers to the invisible gaseous substance surrounding the earth, a mixture mainly of oxygen and nitrogen

**Wind** refers to the movement of air in the atmosphere

Air moves because of pressure systems - it travels from areas of high pressure to areas of low pressure.

**Winds may be classified as**

1. **Prevailing winds** : are major wind patterns that affect large regions. Also known as the trade winds due to their importance to trade by sailing ship back in the time of the great explorers.

The prevailing winds are mainly the result from the transfer of heat energy from the land and oceans to the atmosphere

**Coriolis Effect** refers to the apparent change in the direction of a moving object within a rotating coordinate. The Coriolis effect causes moving air to turn to the right in the Northern Hemisphere and to the left in the Southern Hemisphere

**-The trade winds:**

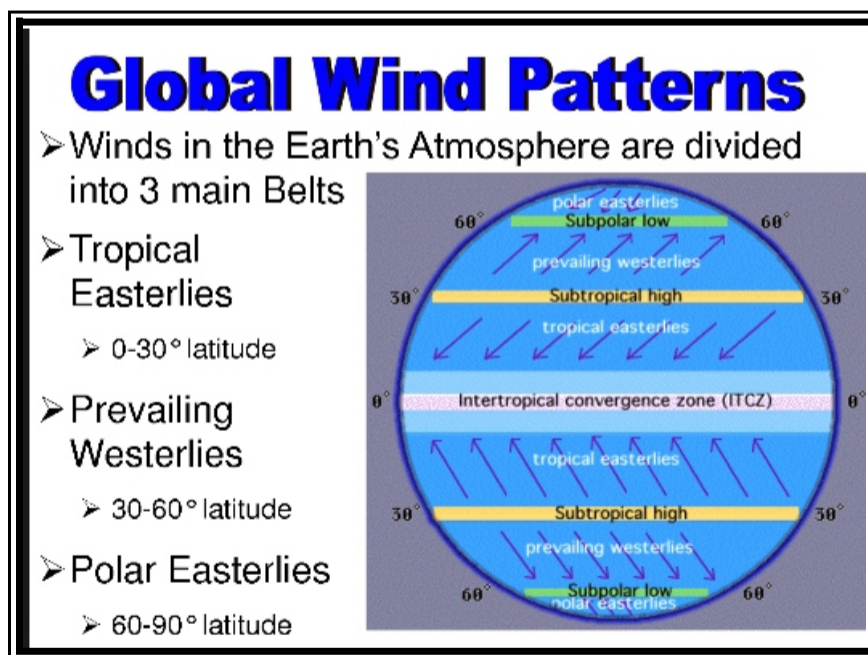
Occurs between the equator and 30° latitude

The sun heats up the air at the equator causing hot air to rise, leaving behind an area of low pressure.

This rising air moves northward, cools, becomes more dense and falls around 30° latitude

This air moves back towards the equator (low pressure) producing the trade winds.

This air movement twists to the right in the N. H. to form northeast trade winds and left in the S. H. to form the southeast trade winds



**-Mid – latitude Westerlies**

occurs between 30° and 60° latitude

At 30° some of the warm air from the equatorial convection currents meets cold polar air, creating low pressure around 60°. The surface air moving north twist to the right in the Northern hemisphere ( Left in SH)

### -Polar Easterlies

occurs between 60° latitude and the poles

Near the poles the air is cold and dense. This sinks and moves toward the equator. The earth's rotation cause this air mass to twist to the right in in the Northern Hemisphere ( Left in the south)

### Jet Stream

High altitude, fast moving, winds in the troposphere that gradually flows from west to the east over the mid latitudes. The jet stream separate cold polar air to its north from warmer air to the south

### Effects of Prevailing Winds:

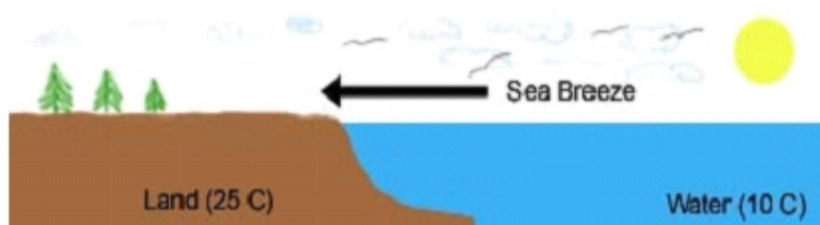
- Distribute large amounts of solar energy from the equator
- Return cooler air to the equator
- Carry moisture
- Cooling air is dry, creating desert like conditions around 30 ° latitude
- At 60 o mixed systems creating unsettling conditions

2. **Local or regional winds:** occurs fairly small areas and are the result of geographical features of the land ( mountains, large bodies of water)

**Thermals:** thermal updrafts

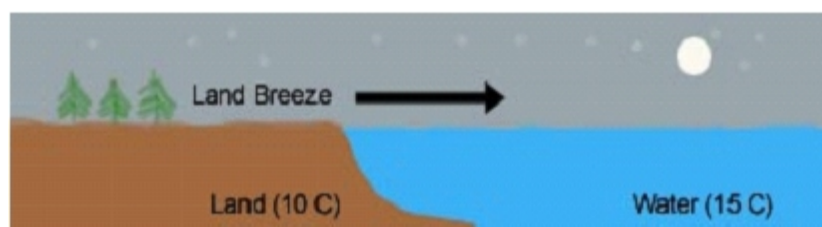
- On a clear, sunny day, solar energy warms the land
- Land absorbs the energy and converts it into heat, which warms the nearby air
- Warm air expands and becomes less dense and rises
- Rising warm air is replaced by cooler, denser air

**Sea Breeze:** A convectional thermal that flows from a large body of water towards the land



- In early morning, solar energy warms the land faster than the water
- Warm air above the land rises and moves out over the water
- Warm air replaced by cooler air from above the water
- Sets up convection current

**Land Breeze:**



- As sun sets, the land cools down faster than the water
- Warm air above the water rises and moves in over the land
- Warm air replaced by cooler air from above the land
- Sets up convection current

**Lake Snow Effect:** When an air mass moves across a large body of water it picks up moisture. In winter the air above the land is colder than the air above the water. Therefore, when air blows onshore the colder temperature causes the moisture to change to snow

**Chinook Winds:** On the west side of the Rockies orographic lifting causes water vapor in the air to condense into clouds, snow and rain. A lot of energy is release during this phase change so that the air is warmed. The air that sinks on the east side is warm and dry producing the warm, dry Chinooks

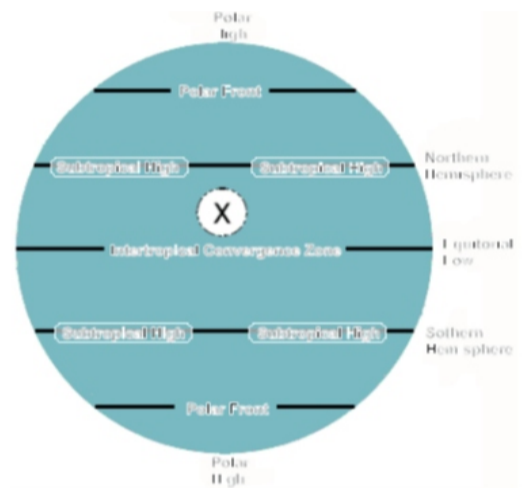
**PART A: Multiple Choice**

**PREVAILING WINDS ( GLOBAL WINDS) :**

1. Which refers to the most common wind direction at a given location?  
(A) monsoon winds  
(B) prevailing winds  
(C) trade winds  
(D) westerly winds
2. Which explains why temperatures decrease as we move from the equator to the poles?  
(A) curvature of Earth  
(B) movement of air from high to low pressure belts  
(C) revolution of Earth around the sun  
(D) rotation of Earth on its axis

3. What prevailing wind system is indicated by X in the graphic below?

- (A) Northeast Trade Winds
- (B) Polar Easterlies
- (C) Southeast Trade Winds
- (D) Prevailing Westerlies



4. Between 30 ° and 60 ° north latitude, which direction do surface winds blow ?  
(A) east to west  
(B) west to east  
(C) south to north  
(D) north to south
5. Which force causes winds to be deflected toward the right in the northern hemisphere?  
(A) force of gravity  
(B) coriolis force  
(C) centripetal force  
(D) centrifugal force
6. Jet streams are high altitude winds. In which direction do the jet streams tend to move?  
(A) east to west  
(B) west to east  
(C) south to north  
(D) north to south
7. Which winds affect the majority of people living in Canada?  
(A) southeast trade winds  
(B) northeast trade winds  
(C) mid-latitude westerlies  
(D) polar easterlies

8. In which direction does the coriolis effect deflect winds of the southern hemisphere?

- (A) north to south
- (B) to the right
- (C) to the left
- (D) south to north

9. How do prevailing winds that travel across large bodies of water affect the climate?

- (A) They make it colder.
- (B) They make it warmer.
- (C) They make it wetter.
- (D) They make it drier.

10. Prevailing winds affect a region's climate by

- (A) creating desert areas.
- (B) causing more precipitation on one side of a mountain.
- (C) affecting how much precipitation it receives.
- (D) controlling the amount of solar energy it receives.

11. What deflects winds to the West or the East?

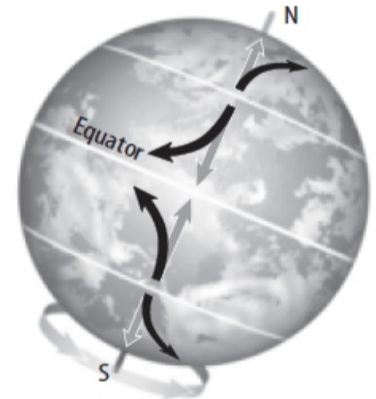
- (A) Convection
- (B) Coriolis Effect
- (C) Jet Stream
- (D) Radiation

12. Why does the equator experience about the same temperatures year-round?

- (A) It tilts toward the sun and gets much more direct solar energy.
- (B) It has no prevailing winds.
- (C) It has no mountains to affect its climate.
- (D) The sun's rays strike the equator at about the same angle all year.

13. The \_\_\_ is caused by the Earth's rotation.

- (A) jet stream
- (B) sea breeze
- (C) Coriolis Effect
- (D) land breeze



14. Which describes the impact of the Coriolis effect in the Southern Hemisphere?

- (A) Winds are deflected to the left of their paths.
- (B) Winds are deflected to the right of their paths.
- (C) Winds move from high to low pressure with no deflection.
- (D) Winds move from low to high pressure with no deflection.

15. What is the name of a strong current of wind that is found in the upper troposphere and forms a boundary between cold polar air and warm tropical air?

- (A) Sea Breeze
- (B) Jet Stream
- (C) Trade Winds
- (D) Polar Easterlies

### Local Wind Patterns:

16. Which best describes a thermal?
- (A) wind rising up the side of a mountain
  - (B) solar energy heats the land causing the air above to rise
  - (C) after sun set, land cools more rapidly than water creating a convection cell
  - (D) warm air is generally more dense than cold air
17. You are vacationing at a cottage on a lake. A flagpole on the deck overlooking the shore tends to blow in an inland direction during the daytime but toward the lake at night. Which statement best explains the morning onshore wind?
- (A) Land heats up faster than water, resulting in an onshore sea breeze.
  - (B) Land heats up faster than water, resulting in an offshore land breeze.
  - (C) Water heats up faster than land, resulting in an onshore sea breeze.
  - (D) Water heats up faster than land, resulting in an offshore land breeze.
18. At what time do sea breezes normally occur?
- (A) middle of the night around midnight
  - (B) middle of the day around noon time
  - (C) following sunrise to sunset
  - (D) following sunset to sunrise
19. Which statement is true about local winds?
- (A) sea breezes are generally stronger than land breezes
  - (B) land breezes are generally stronger than sea breezes
  - (C) thermals normally occur after sunset
  - (D) sea breezes blow from land toward the water
20. Why does air become less dense as it is heated?
- (A) air expands when heated so there are fewer particles of matter in the same volume
  - (B) air contracts when heated so there are fewer particles of matter in the same volume
  - (C) warmer air holds less moisture, less water means lower density
  - (D) warmer air holds more moisture, more water means lower density
21. The uneven heating of land and water causes \_\_\_\_\_.
- (A) clouds
  - (B) land and sea breezes
  - (C) precipitation
  - (D) tornadoes
22. Which explains why people living near the shore of a large body of water tend to be cooler in summer?
- (A) thermals carry heat away from the land
  - (B) sea breezes bring cooler air
  - (C) land breezes bring cooler air
  - (D) water is always cooler than the land
23. Which is the main factor in causing local winds?
- (A) land has a higher heat capacity than water
  - (B) water has a high latent heat of evaporation
  - (C) water has a low latent heat of evaporation
  - (D) water has a higher heat capacity than land

24. When cool, dense air from over the water flows inland, it's called a \_\_\_\_.

- (A) sea breeze
- (B) jet stream
- (C) polar easterly
- (D) land breeze

25. Which conditions result in a sea breeze?

- (A) absence of a water body
- (B) colder land and warm waters
- (C) high pressure over the water
- (D) warm day time temperature