

# Centralized Exam 3 Study Guide Grade 7



## Chapter 13: Climate

## **Focus:**

### **Chapter 13:**

- 13.1 Earth's Climate
- 13.2 Climate Cycles

#### **13.1 Earth's Climate**

1. What is climate?
2. Why is one climate different from another?
3. How are climates classified?

#### **13.2 Climate Cycles**

1. How has climate varied over time?
2. What causes seasons?
3. How does the ocean affect climate?

## Key Study Points:

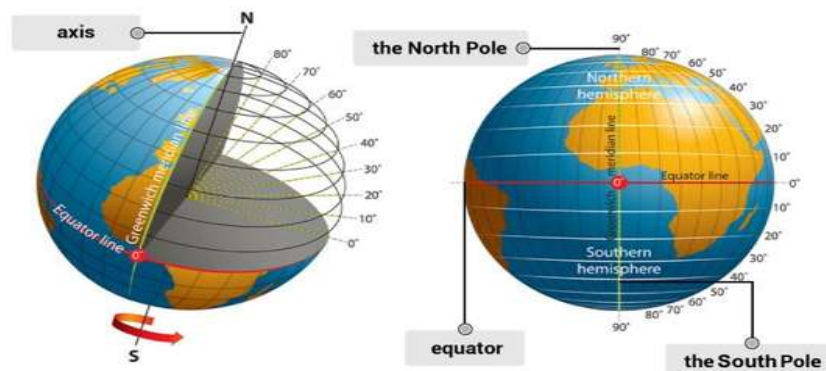
### 1. What is climate?

\*\*\*Climate is the average weather conditions in an area over a long period.

#### What affects climate?

1. lines of latitude: Latitude is the distance north or south of the equator.

Latitude increases from  $0^\circ$  to  $90^\circ$  from the equator towards the North Pole or the South Pole.

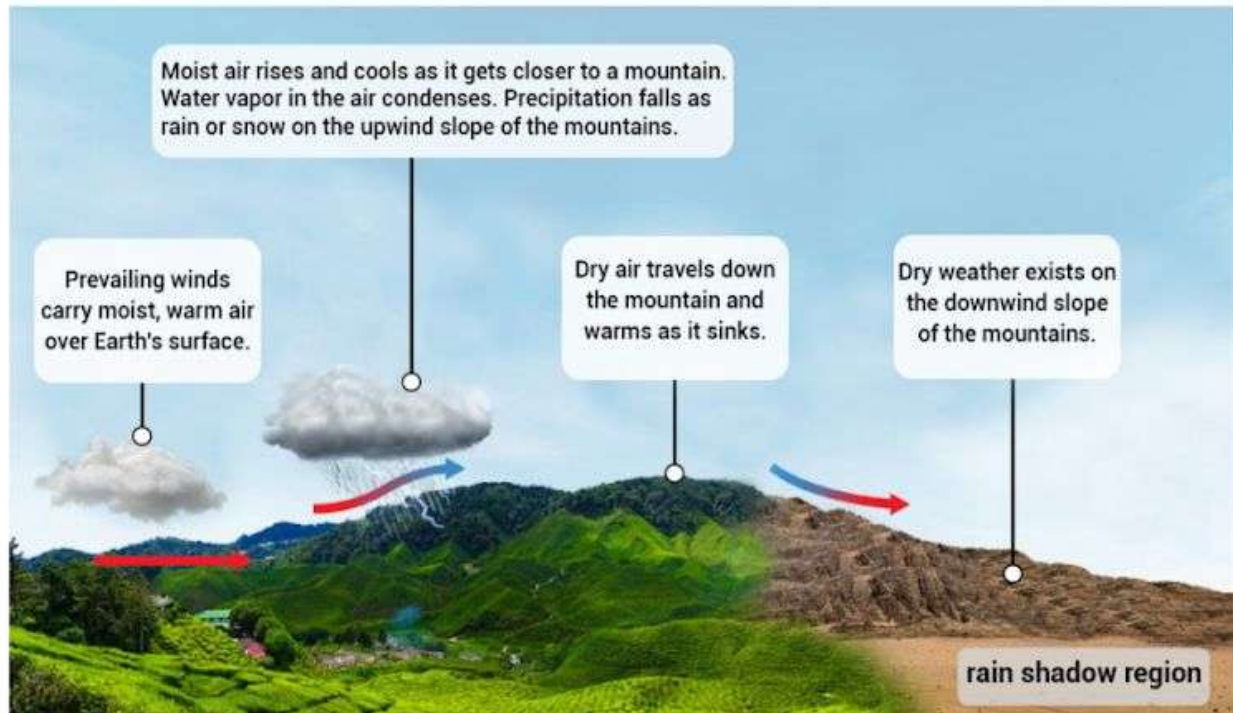


2. Altitude: temperatures can drop as you move higher up

This is another way mountains affect the climate by creating **rain shadow**.

→ A rain shadow is a region with low rainfall on the downhill side of a mountain.

## Events that result in a rain shadow



### 3. Large bodies of water: weather along the coastline remains constant but changes at the center of a continent

→ Specific heat causes the climate along coastlines to remain more constant than inland.

### 4. Buildings and concrete: Buildings and concrete can absorb solar energy that is why the urban climate can be different to rural climates

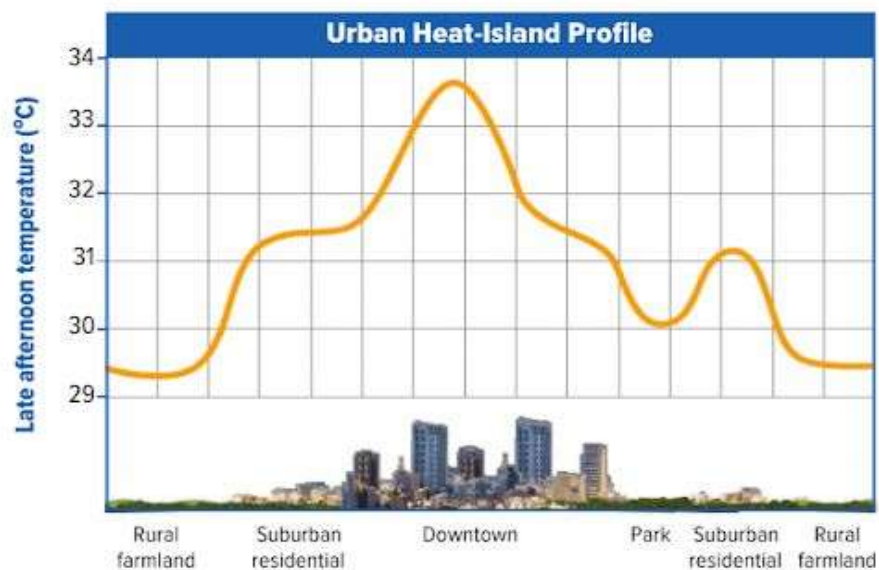
## 2. Why is one climate different from another?

## 3. How are climates classified?

### Microclimates:

#### Microclimates

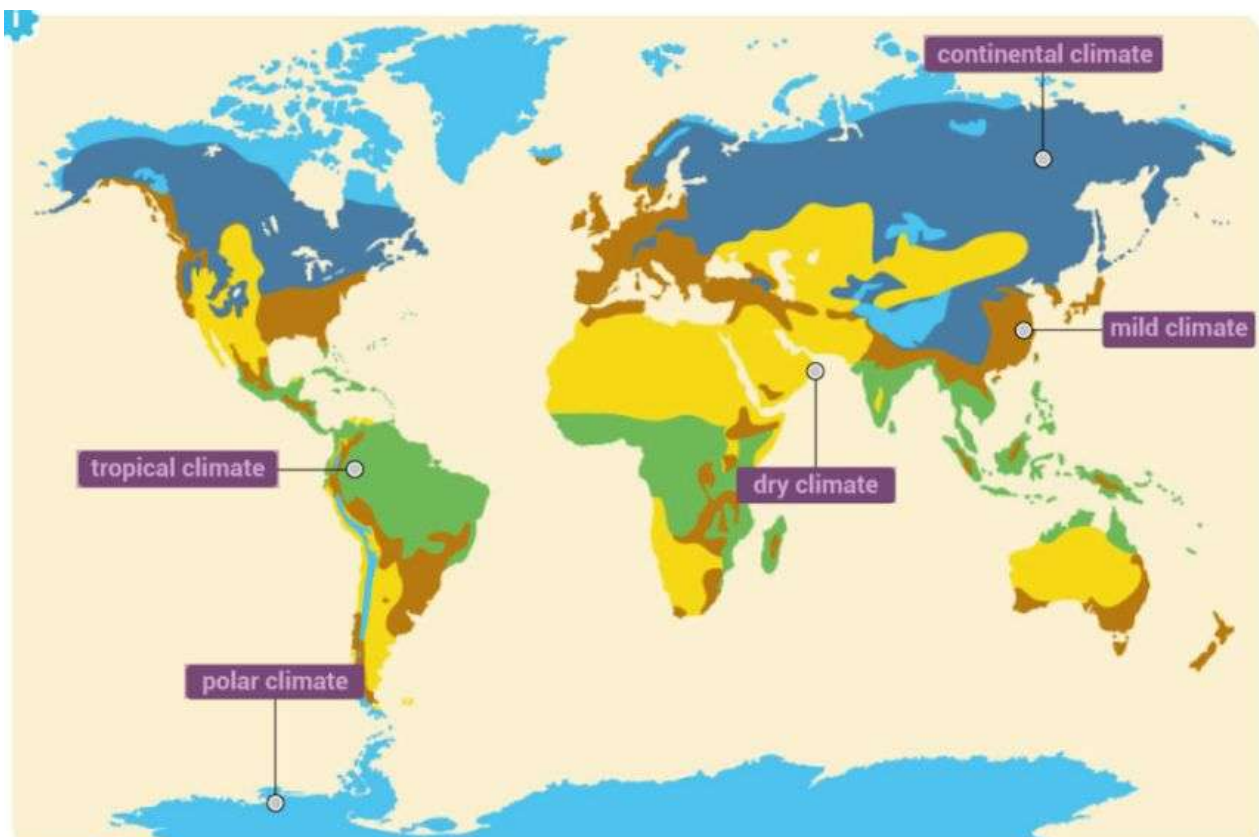
Roads and buildings in cities have more concrete than surrounding rural areas. The concrete absorbs solar radiation, causing warmer temperatures than in the surrounding countryside. The result is a common microclimate called the urban heat island, as shown in **Figure 5**. A **microclimate** is a localized climate that is different from the climate of the larger area surrounding it. Other examples of microclimates include forests, which are often cooler and less windy than the surrounding countryside, and hilltops, which are windier than nearby lower land.



### Köppen climate classification

- A German scientist, Wladimir Köppen, in 1918 came up with a way of classifying different climates.
- It is known as the Köppen climate classification system.

→ The map below uses different colors to show the Köppen climate classification. All areas in the same color have the same climate.



#### 4. How has climate varied over time?

## Climate Cycles

- Scientific evidence shows that climate changes in **cycles**.  
Though the cycle may take several years to complete, some years the climate was hot and some years it was cold.

***Scientists learn about past climates by studying the:***

ice cores	fossilized pollens	ocean sediments	grow rings of trees
			

## **5. What causes seasons?**



## Solstices and Equinoxes

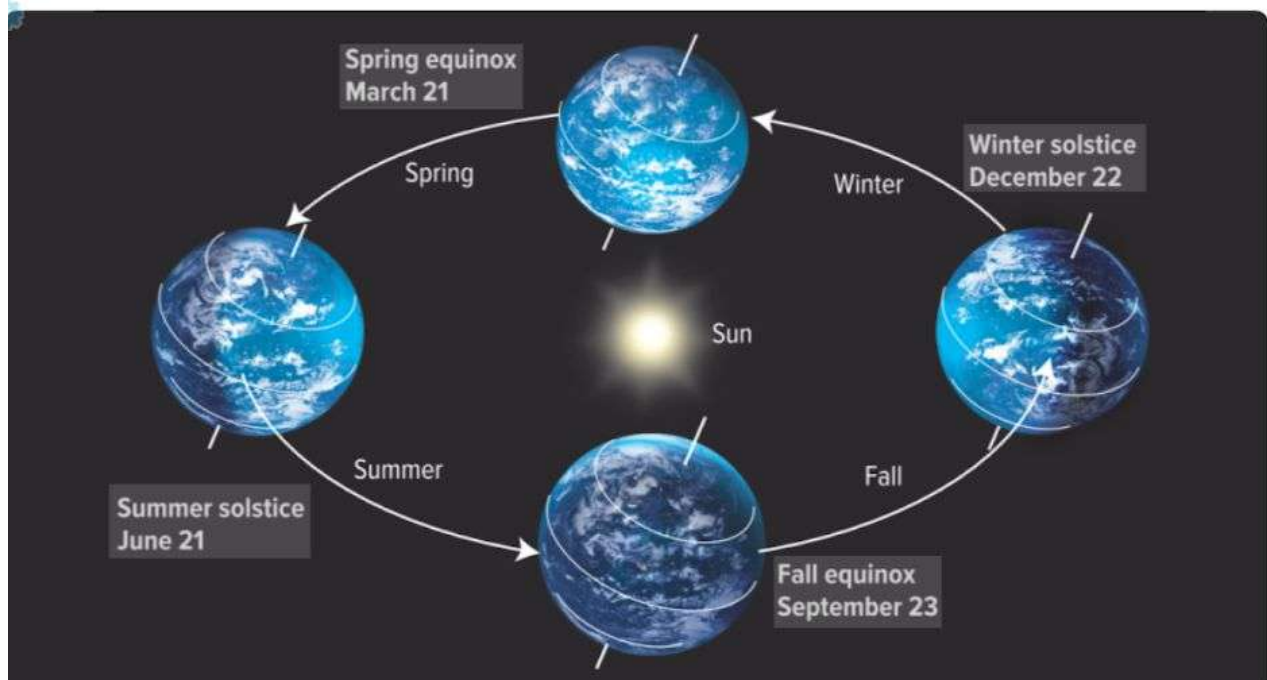
During Earth's yearly revolution (حركة الأرض حول الشمس), **four important days mark the start of a new season.**

They are:

- summer solstice
- winter solstice
- fall equinox
- spring equinox

### Important:

1. The **solstices** are the **beginning of summer and winter.**
2. The **equinoxes** are the **beginning of spring and fall.**



## 6. How does the ocean affect climate?



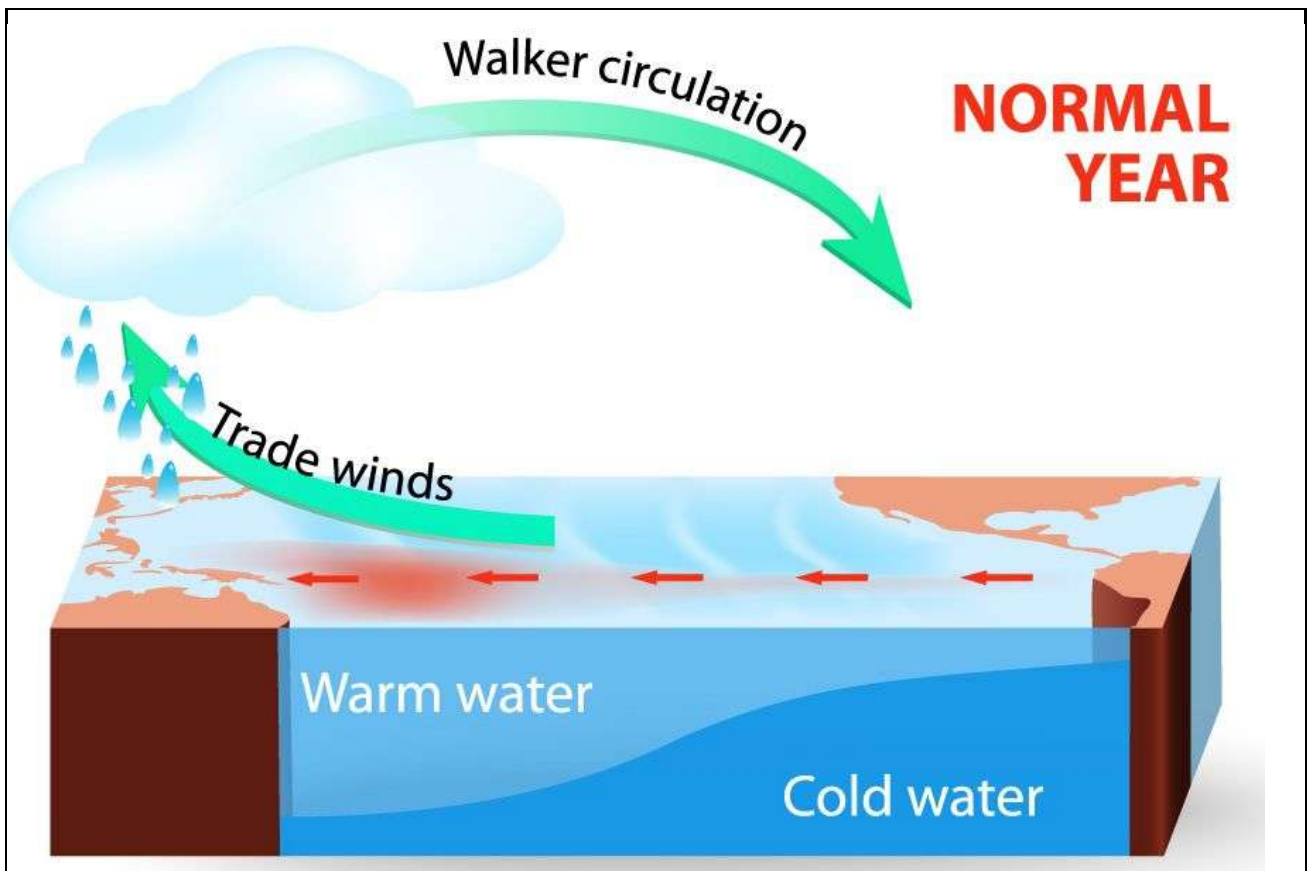
Recall that short-term climate cycles are caused by:

- change in seasons
- interactions between the ocean and the atmosphere

When trade winds blow (East → West), they create:

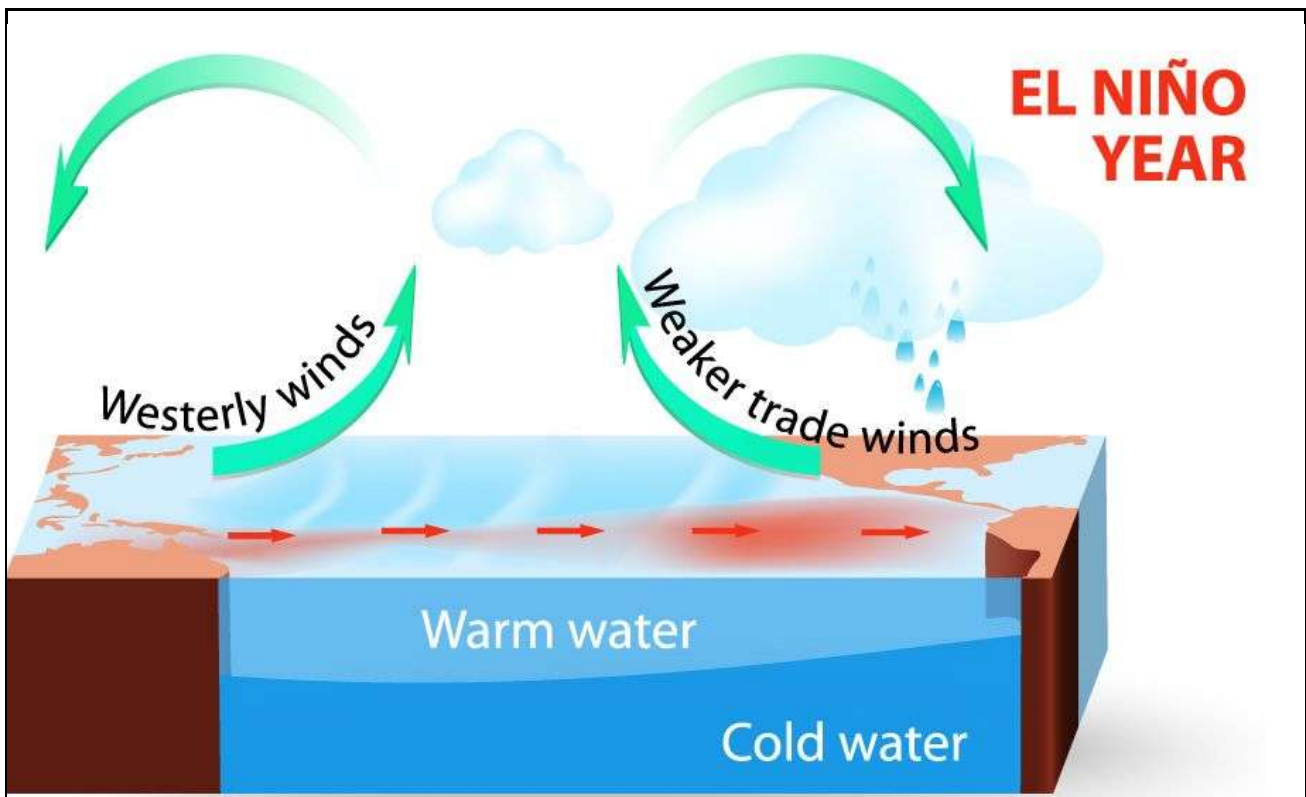
- a high-pressure area on one side of the Pacific Ocean
- a low-pressure area on the other side of the Pacific Ocean
- the winds push warm water on the surface and cold water rushes upward

**This pressure difference between each side of the Pacific Ocean keeps trade winds blowing normally when there's no El Niño.**



### The El Niño/Southern Oscillation (ENSO) Cycle

- The interaction between the ocean and the atmosphere is called El Niño. It usually takes place across the **Pacific Ocean**.
- El Niño/Southern Oscillation cycle is the combined ocean and atmospheric cycle that weakens trade winds across the Pacific Ocean.



### The El Niño/Southern Oscillation (ENSO) Effects

- During El Niño, the trade winds lose strength and sometimes blow in the other direction

The following are the El Niño/Southern Oscillation (ENSO) Effects:

western coast of South America which is normally cold becomes warm

western coast of South America receive lots of rain

Earth climate changes for some time

droughts occur in wet areas of the world

## Monsoon

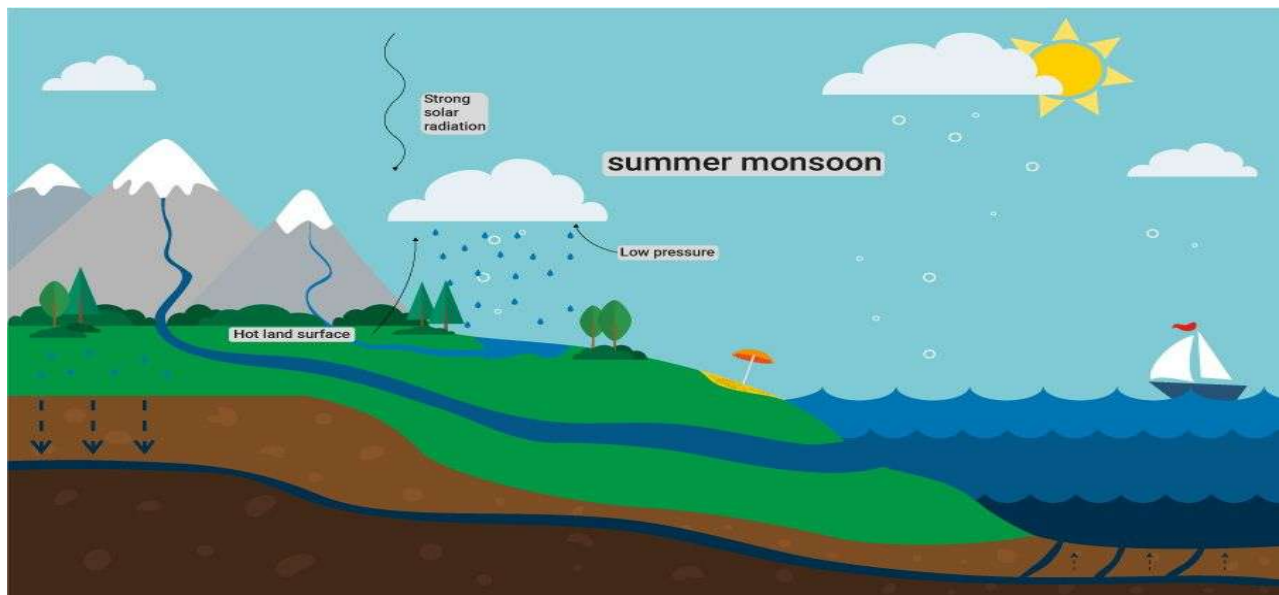
Another climate cycle involving the ocean and the atmosphere is monsoon.

- A monsoon is a seasonal (موسمي) event, where the winds change direction, causing heavy rain.

**Monsoon season occurs in both winter and summer months.**

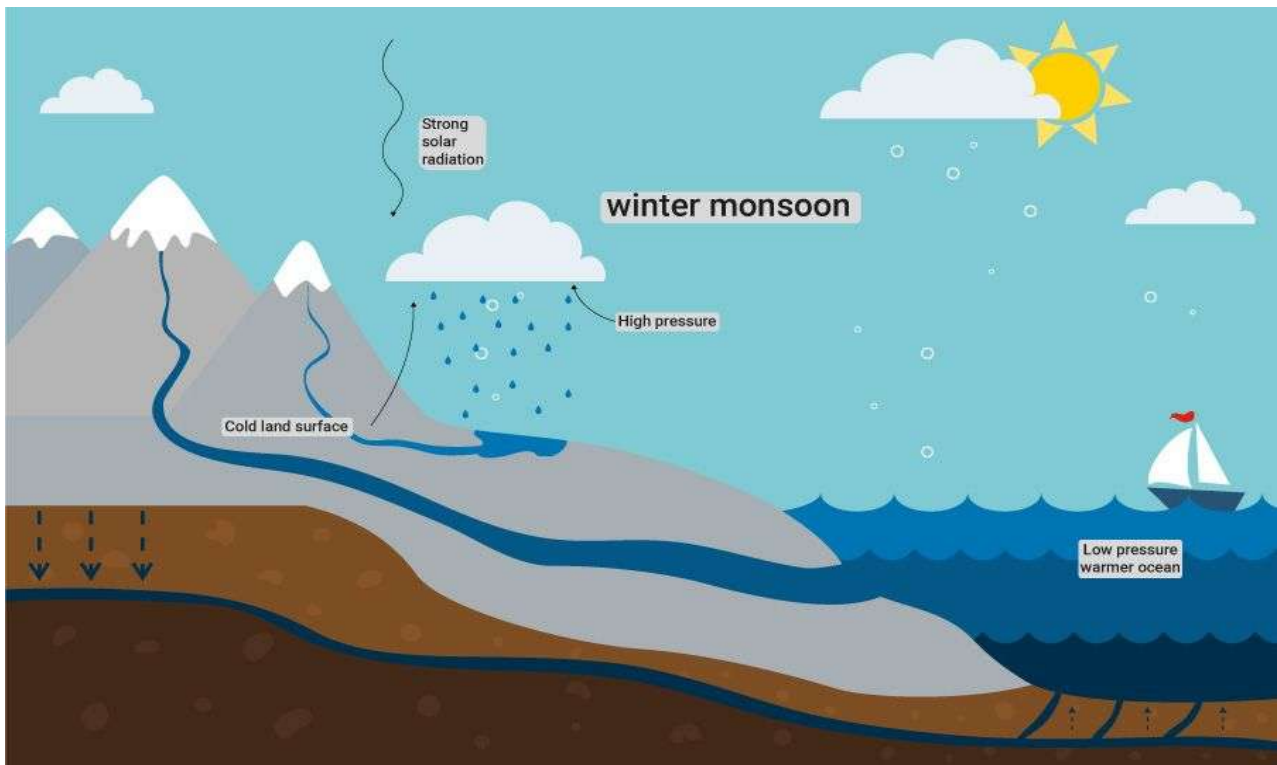
### 1. Summer :

- warm air rises and creates low pressure over land
- cold and heavy air sinks over the water, creating high pressure area
- the wind blow from the water towards the land
- heavy rain occurs, the summer is wet



## 2. Winter:

- warm air rises and create low pressure over the water
- cold and heavy air sinks over the land, creating high pressure area
- the wind blow from the land towards the water
- the weather is dry



**Note:** Cherrapunji, India, is one of the world's wettest locations.

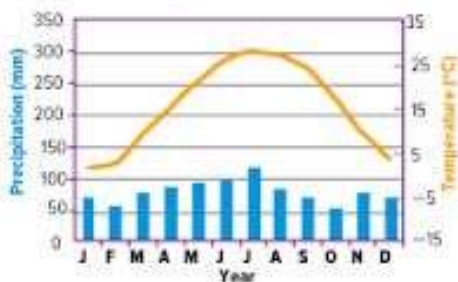
It receives an average of 10 m of monsoon rainfall each year.

# Review Questions & Answers:

## 13 Review

### Understand Key Concepts

- The specific heat of water is \_\_\_\_\_ than the specific heat of land.  
 A. higher                      B. lower  
 C. less efficient              D. more efficient
- The graph below shows average monthly temperature and precipitation of an area over the course of a year.



Which is the most likely location of the area?

- in the middle of a large continent
  - in the middle of the ocean
  - near the North Pole
  - on the coast of a large continent
- Which are warm periods during or between ice ages?  
 A. ENSO  
 B. interglacials  
 C. monsoons  
 D. Pacific oscillations
  - Long-term climate cycles are caused by all of the following EXCEPT  
 A. changes in ocean circulation.  
 B. Earth's revolution of the Sun.  
 C. the slow movement of the continents.  
 D. variations in the shape of Earth's orbit.
  - A rain shadow is created by which factor that affects climate?  
 A. a large body of water  
 B. buildings and concrete  
 C. latitude  
 D. mountains

- During which event do trade winds weaken and the usual pattern of pressure across the Pacific Ocean reverses?  
 A. drought  
 B. El Niño/Southern Oscillation event  
 C. North Atlantic Oscillation event  
 D. volcanic eruption

- The picture below shows Earth as it revolves around the Sun.



Which season is it in the southern hemisphere in July?

- fall
  - spring
  - summer
  - winter
- Which is not a greenhouse gas?  
 A. carbon dioxide  
 B. methane  
 C. oxygen  
 D. water vapor
  - Which cools the climate by preventing sunlight from reaching Earth's surface?  
 A. aerosols  
 B. greenhouse gases  
 C. lakes  
 D. water vapor molecules
  - Which action can reduce greenhouse gas emissions?  
 A. building houses on permafrost  
 B. burning fossil fuels  
 C. cutting down forests  
 D. driving a hybrid vehicle



## Answers:

### Understand Key Concepts

1. **A.** higher
2. **A.** in the middle of a large continent
3. **B.** interglacials
4. **C.** the slow movement of the continents.
5. **D.** mountains
6. **B.** El Niño/Southern Oscillation event
7. **D.** winter
8. **C.** oxygen
9. **A.** aerosols
10. **D.** driving a hybrid vehicle



## Standardized Test Questions

# Standardized Test Practice

Record your answers on the answer sheet provided by your teacher or on a sheet of paper.

### Multiple Choice Aligned with TIMSS

- 1 Which is a drawback of a global climate model?
- A Its accuracy is nearly impossible to evaluate.
  - B Its calculations are limited to specific regions.
  - C Its predictions are short-term only.
  - D Its results are difficult to interpret.

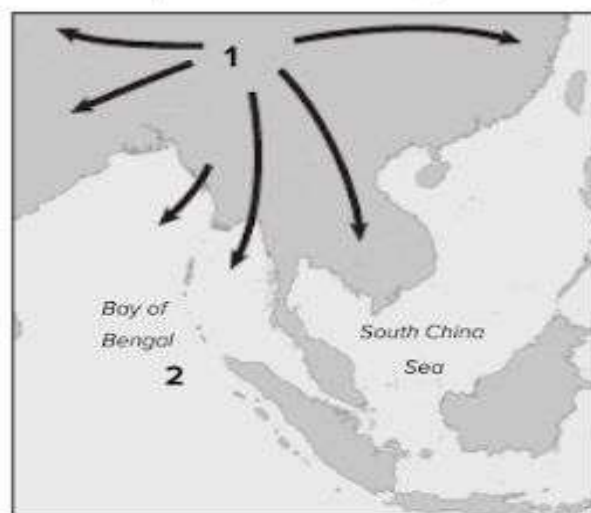
Use the diagram below to answer question 2.



- 2 What kind of climate would you expect to find at position 4?
- A mild
  - B continental
  - C tropical
  - D dry
- 3 The difference in air temperature between a city and the surrounding rural area is an example of a(n)
- A inversion.
  - B microclimate.
  - C seasonal variation.
  - D weather system.
- 4 Which does NOT help explain climate differences?
- A altitude
  - B latitude
  - C oceans
  - D organisms

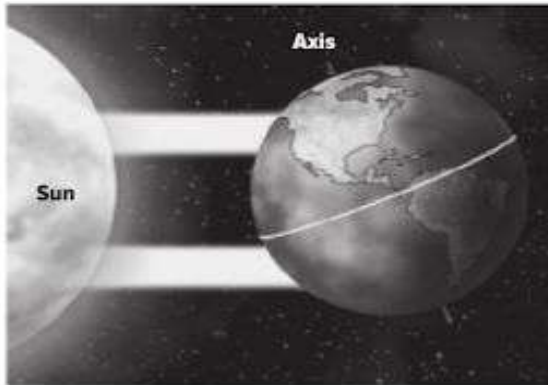
- 5 What is the primary cause of seasonal changes on Earth?
- A Earth's distance from the Sun
  - B Earth's ocean currents
  - C Earth's prevailing winds
  - D Earth's tilt on its axis

Use the diagram below to answer question 6.



- 6 In the above diagram of the Asian winter monsoon, what does 1 represent?
- A high pressure
  - B increased precipitation
  - C low temperatures
  - D wind speed
- 7 Climate is the \_\_\_\_\_ average weather conditions that occur in a particular region. Which completes the definition of *climate*?
- A global
  - B long-term
  - C mid-latitude
  - D seasonal

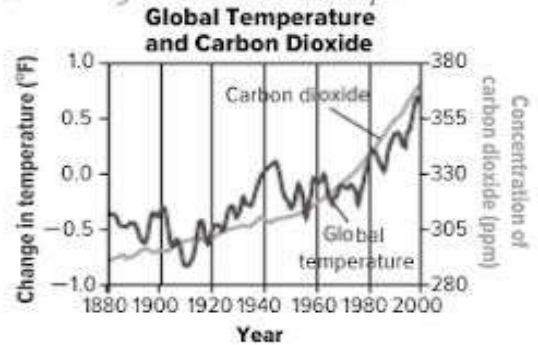
Use the diagram below to answer question 8.



- 8 In the diagram above, what season is North America experiencing?
- A fall
  - B spring
  - C summer
  - D winter
- 9 Which climate typically has warm summers, cold winters, and moderate precipitation?
- A continental
  - B dry
  - C polar
  - D tropical
- 10 Which characterizes interglacials?
- A earthquakes
  - B monsoons
  - C precipitation
  - D warmth

## Constructed Response Aligned with TIMSS

Use the diagram below to answer question 11.



- 11 Compare the lines in the graph above. What does this graph suggest about the relationship between global temperature and atmospheric carbon dioxide?

Use the table below to answer questions 12 & 13

Human Sources	Natural Sources

- 12 List two human and three natural sources of carbon dioxide. How do the listed human activities increase carbon dioxide levels in the atmosphere?
- \_\_\_\_\_
- \_\_\_\_\_
- 13 Which human activity listed in the table above also produces aerosols? What are two ways aerosols cool Earth?
- \_\_\_\_\_
- \_\_\_\_\_

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### Need Extra Help?

If You Missed Question...	1	2	3	4	5	6	7	8	9	10	11	12	13
Go to Lesson...	3	1	1	1	2	2	1	2	1	2	3	3	3

## **Answers:**

### **Multiple Choice Aligned with TIMSS**

- 1 A—Correct.** B, C, D—Because global climate models (GCMs) predict climatic conditions several decades in the future, their predictions and forecasts cannot be compared immediately to real data. For this reason, the accuracy of GCMs is nearly impossible to evaluate.
- 2 D—Correct.** A, B, C—Because of the rain shadow event, there is little moisture that reaches points 3 and 4. At point 4, a dry climate will persist.
- 3 B—Correct.** A, C, D—A microclimate is a localized climate that differs from the climate of the larger area that surrounds it.
- 4 D—Correct.** A, B, C—Living beings other than humans have little effect on climate but have adaptations to the climate.
- 5 D—Correct.** A, B, C—Because Earth is tilted on its axis as it revolves around the Sun, the amount of solar radiation a hemisphere receives varies. When a hemisphere tilts toward the Sun, it receives greater solar radiation, which causes spring and summer; when it tilts away from the Sun, it receives less radiation, resulting in autumn and winter.
- 6 A—Correct.** B, C, D—A monsoon is a wind circulation pattern (caused by temperature differences between land and water) that changes direction with the season. During winter, high pressure inland changes the direction of wind patterns, blowing air from land to water.
- 7 B—Correct.** A, C, D—Weather in any given location changes daily. Scientists, therefore, average precipitation amounts, temperatures, and other weather factors to determine climate, or long-term weather conditions in a particular region.
- 8 C—Correct.** A, B, D—Because the northern hemisphere is tilted toward the Sun in the diagram, the hemisphere receives greater solar radiation, resulting in summer.
- 9 A—Correct.** B, C, D— Köppen's system of climate types classifies regions by precipitation, temperature, and native vegetation. Of the five climate types identified, continental climates feature warm summers, cold winters, and moderate precipitation.
- 10 D—Correct.** A, B, C—The characteristic warmth of interglacial periods, which occur during ice ages, causes glaciers to recede.