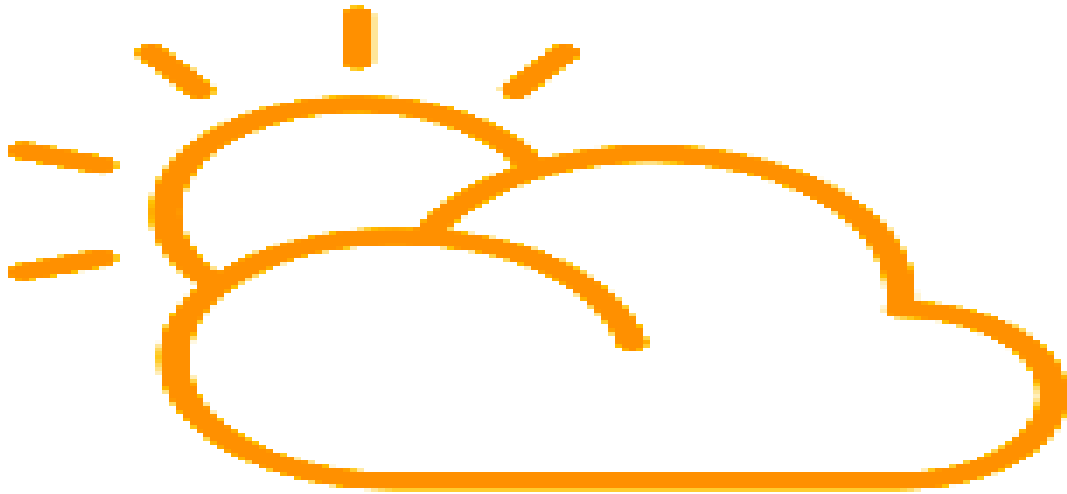




GEOGRAPHY NOTES FORM 2

CLIMATE



Specific Objectives

By the end of the topic, the learner should be able to:

- a. distinguish between weather arid climate
- b. explain the factors that influence climate
- c. describe the characteristics of climatic regions of Kenya
- d. describe the characteristics of major climatic regions of the world
- e. account for the causes of aridity and desertification
- f. explain the effects and possible solutions to aridity and desertification
- g. discuss the causes and impact of climate change on the physical and human environment.

CLIMATE

Climate means the usual condition of the temperature, humidity, atmospheric pressure, wind, rainfall, and other meteorological elements in an area of the Earth's surface for a long time. In simple terms climate is the average condition for about thirty years.

Average weather conditions of a given place over a long period of time usually 30-35 years.

Factors Influencing Climate

Latitude

- It influences temperature whereby low latitudes have high temperature and high latitudes have low temperature due to the angle at which the sun rays strike the earth and the distance travelled by the sun's rays.
- It also influences rainfall whereby places in the equator receive rainfall in two seasons when the sun is overhead there while northern and southern tropical areas receive rainfall when the position of the sun is overhead in those areas.

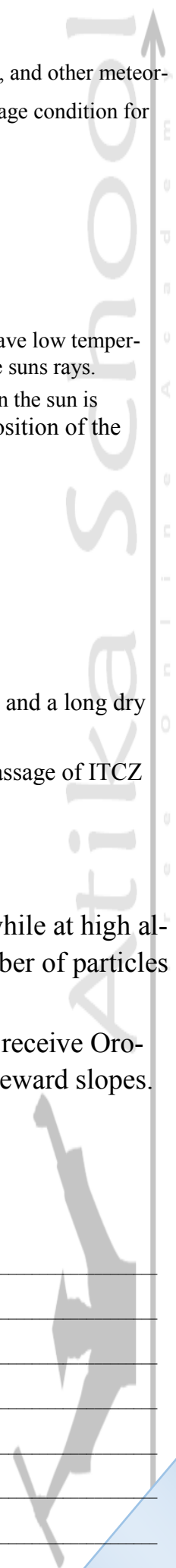
Inter-Tropical Convergence Zone

- It's a low pressure belt around equator where trade winds converge.
- It influences rainfall in the following ways:
- Places further from equator experience one rainy season when the sun is overhead and a long dry season when the sun is in the S. hemisphere.
- Regions near equator have 2 seasons of heavy rainfall because they experience passage of ITCZ twice.

Altitude

- It influences temperature whereby at low altitude temperature is high while at high altitude it's lower due to the thickness of atmosphere determining the number of particles to store heat and distance from space where terrestrial radiation is lost.
- It also influences rainfall whereby mountains on the path of rain winds receive Orographic rainfall and the windward slopes receive heavier rainfall than leeward slopes.

Learner's Short Notes



Distance from the Sea

- It influences temperature whereby places in temperate regions near the sea experience low temperature during summer onshore winds blowing over cold ocean water and taking the cooling influence on adjacent land because the water is heated at a slower rate than land.
- Places near the sea also experience higher temperatures during the winter or cool season due to sea breezes carrying warmer air to the land because water loses heat at a slower rate than land.
- Temperatures in the interior of continents tend to be high in summer and very low in winter due to lack of marine influence.
- It also influences rainfall whereby coastal regions receive a lot of rain when the winds are onshore and the continental interiors receive less rain mainly in summer because onshore winds will have dropped most of moisture along the way.

Ocean Currents

- It influences temperature whereby coasts which are washed by warm ocean currents are warmer while those washed by cold ocean currents are cooler due to the onshore winds being either warmed or cooled and then taking the warmth or coolness to the land.
- It influences rainfall whereby coasts washed by warm ocean currents experience heavy rainfall when moist onshore winds are warmed by the current and made to hold on to moisture which they release on reaching the land.
- The coasts washed by cold ocean currents on the other hand experience low rainfall as a result of moist winds being cooled and moisture in them condensed resulting in rain falling over the ocean thereby bringing little or no rain to the coastal areas. This is the cause of western margin deserts e.g. Kalahari and Namib deserts.

Aspect

Direction of slope in relation to sunlight and the rain bearing winds. Its effect on temperature is more pronounced in the northern and southern hemisphere.

- In the N and S hemispheres the slopes facing sun are warmer while those facing away are cooler.
- The slopes in the direction of rain winds i.e. the windward slopes receive heavier relief rainfall than the leeward side.

Learner's Short Notes

Winds and Air Masses

Wind blowing from a warm region warms the region its passing over and if blowing from a cool region cools the region it's passing over since wind is a medium of transfer of heat.

- Sea breezes take cooling influence on land during hot afternoons.
- Katabatic winds cause low night temperatures on valleys and foot of mountains.
- Fohn and Chinook which are descending dry winds take dryness to the leeward sides of Alps and Rockies.

Winds influence rainfall in the following ways:

- Anabatic winds cause afternoon showers on mountainous regions.
- Moisture laden winds cause heavy rainfall.
- Persistent dry winds cause desert like conditions in the area they pass over e.g. Harmattan winds from Sahara which blow over W. Africa.
- Regions around large water bodies experience high rainfall because of the effect of land breezes.

Configuration of Coastline

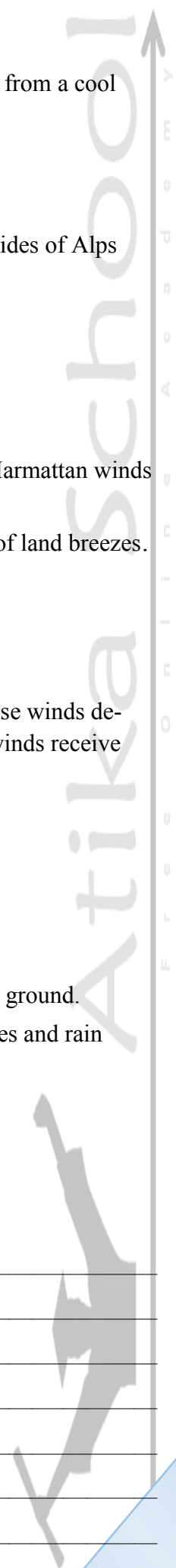
Coastal regions across the path of moisture laden winds receive higher rainfall because winds deposit moisture on land e.g. Mombasa while those lying parallel to the path of those winds receive less rainfall because moisture is deposited on the sea e.g. Lamu.

Forests

Forested areas experience a micro climate whereby:

- Temperature is lower due to shades of trees reducing solar insolation reaching the ground.
- Rainfall is heavier due to high rate of evapotranspiration and friction between trees and rain bearing winds.

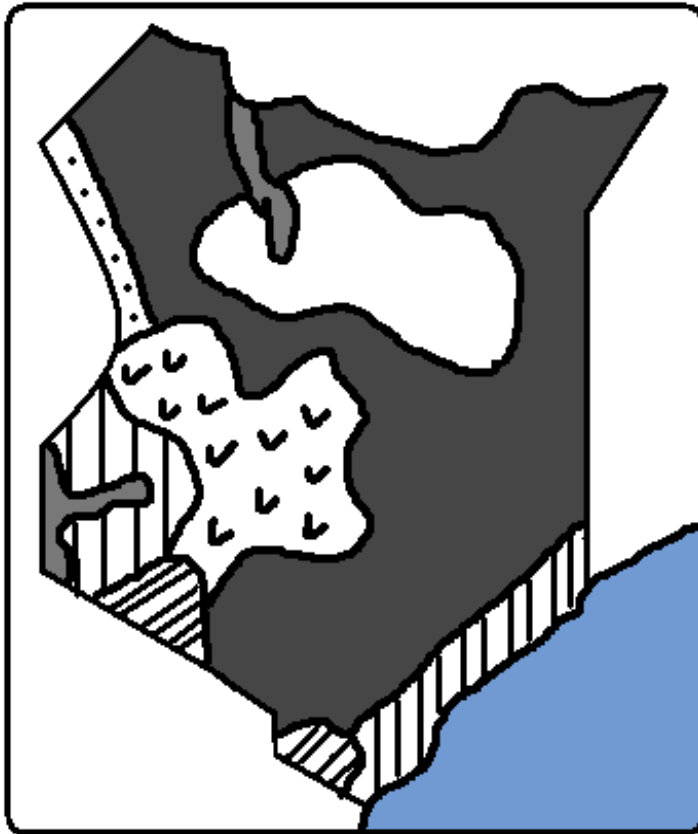
Learner's Short Notes



Human Activities

- Man has caused deforestation in the process of creating room for settlement and agriculture which has caused drop in rainfall amounts leading to semi-arid conditions.
- Man has constructed dams across rivers and done afforestation which has caused semi-arid regions to become wetland.
- Gases especially co2 emitted from burning fossil fuels and chlorofluorocarbons layer cause global warming through the green house effect and destruction of ozone layer respectively.

The Climatic Regions of Kenya



Learner's Short Notes



Modified Equatorial Climate

Experienced along the coast and along the coast from Somali-Tanzanian border and L. Victoria basin regions around the lake.

Along the Coast

Characteristics

- High temperatures throughout the year mean annual about 27°C.
- Small mean annual range of temperature about 4°C.
- Hottest months are December and January.
- Experiences rainfall throughout the year/ no real dry season.
- Double maxima rainfall regime (2 rain seasons) in May and October.
- High humidity due to high temperature causing high rates of evaporation and nearness to the sea.

L. Victoria Basin

Characteristics

- Temperature is lower than the truly equatorial climate due to modifying influence of the lake (mean annual range between 22-26°C).
- There are no real dry months.
- Heavy rainfall ranging from 1000-600mm.
- Double maxima rainfall regime.
- Receives convectional type of rainfall which falls mainly in the afternoons.
- High relative humidity due to high temperature and nearness to the lake which is a source of moisture.

Modified Tropical Climate

Experienced in central highlands E and W of R. Valley.

Learner's Short Notes



Characteristics

- Mean annual temperatures averages between 17-24°C.
- Lower warmer slopes and cooler higher slopes due to modification by altitude.
- Receives rainfall throughout the year (1000-2000mm).
- Receives Orographic rainfall caused by S.E Trade Winds.
- Double maxima rainfall regime in eastern highlands and single maximum in the W. highlands.
- Humidity is moderate.

Tropical Continental/desert Climate

Experienced in about ½ of Kenya in most of N, N.E, most of E and S Kenya.

Characteristics

- High temperatures throughout the year with mean between 22 and 27°C.
- Generally dry with less than 500mm of unreliable rainfall.
- Large diurnal range of temperature.
- The skies are generally clear.
- Low humidity.
- Temperature has been modified by relief in some areas e.g. Voi-25°C and Garissa -28.5°C.

Tropical Climate

Experienced in Narok, S. Taita and Kwale region.

Characteristics

- High temperatures (mean annual temp-16.5°C).
- Temperature is modified by relief in some areas e.g. Loita, Taita and Narok which has made the place suitable for human habitation.
- Generally low rainfall amounts.
- Rain falls in one season.
- A long dry season lasting up to 6 months.

Learner's Short Notes



Tropical Northern Climate

Experienced in a small area in the N. W part of Kenya bordering Uganda.

Characteristics

- High average temperatures.
- Temperatures are modified in some places by altitude.
- Low mean annual rainfall of about 850mm.
- Rain falls mainly in June and September.
- Experiences a long dry season of up to 6 months.

Desert Climate

Experienced in central northern Kenya where there are pure deserts such as Chalbi, Karoli and Kaisut deserts.

Characteristics

Temperatures are very high throughout the year averaging 30°C due to cloudless skies.

- Very low rainfall of less than 250mm per year.
- Characterized by diverging or descending winds which don't bring any rain.
- Night temperatures are extremely low.
- Humidity is low.
- Sandstorms are common occurrences.

World Climatic Regions

Classifications

1. Hot climates
2. Warm climates
3. Cool climates
4. very cold climates
5. Mountain climates
6. micro/local climates

Learner's Short Notes



Hot/Tropical Climates

Experienced within the tropical latitudes.

Subdivided into:

- i) Equatorial climate
- ii) Tropical monsoon climate
- iii) Savannah climate/Sudan type
- iv) Tropical desert climate
- v) Tropical marine climate.

Equatorial climate

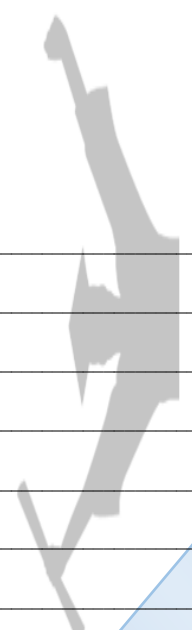
Experienced in the following areas:

- a) Amazon basin in S. America.
- b) Along west coast of Africa from guinea to Cote d' Ivoire.
- c) Southern part of Nigeria through Cameroon, Gabon, Central African Republic, Congo to Zaire.
- d) S.E Asia in Malaysia, Indonesia and a stretch between Burma and Vietnam.

Characteristics

- High temperatures throughout the year (between 24-27°C).
- Temperature neither rises nor drops too low due to thick cloud cover all year round.
- Heavy rainfall throughout the year (mean annual of about 2000mm).
- Double maxima rainfall regime.
- Experiences convectional rainfall in low lands and relief rainfall in areas of high relief.
- High relative humidity of over 80% due to convergence of moist air masses and high evapotranspiration rates.
- Low pressure all year round.
- There are no seasons.

Learner's Short Notes



Tropical Monsoon Climate

It's found in the following areas:

- S.E Asia in parts of Pakistan, India, Bangladesh, S. china and Philippines.
- Along the northern coastal region of Australia.

Characteristics

- a. High mean annual temperatures of about 28°C.
- b. Seasonal reversal of winds.
- c. Heavy rainfall when monsoon winds are onshore (600-1300mm) climate.
- d. Rain falls in a few months and the rest of the year is dry due to influence of latitude.
- e. Low pressure in summer when winds blow onshore.
- f. High pressure in summer when winds blow offshore.
- g. Cloudy skies in summer and clear skies in winter.

Tropical Marine Climate

It's found on windward slopes of islands and coastal areas on the east of continents under the influence of S.E Trade Winds in the following areas:

- (a) C. America in S. Mexico through Guatemala, Nikaragua and Panama.
- (b) N. coast of S. America.
- (c) Caribbean islands of Cuba, Haiti and Jamaica.
- (d) Coastlands of E. Africa from Kenya, Tanzania through Mozambique and E. Malagasy.

Characteristics

- i) Summer temperatures are very high approximately 30°C.
- ii) High rainfall totals in summer when winds are onshore (1000-2000mm).
- iii) Orographic and convectional rainfall in summer.
- iv) Dry winters due to winds being offshore.
- v) High humidity due to coastal location.
- vi) Experiences tropical cyclones towards end of hot season.
- vii) Winters are cool (about 21°C).

Learner's Short Notes



Tropical Continental/Savanna/ Sudan type

The largest natural climatic region in Africa.

It's found in the following areas:

- a) In Africa it extends from Senegal through E. Africa to the northern part of s. Africa.
- b) Western Madagascar.
- c) A broad belt in N. Australia.
- d) N.W and S.E of Amazon Basin called Llanos and Campos.

Characteristics

- a. Higher temperatures of up to 32° in hot season.
- b. Large diurnal range of temperature in dry season.
- c. Convictional rainfall in summer averaging 765mm annually.
- d. High humidity during the hot wet season.
- e. Low humidity in cooler drier months.
- f. Prevailing winds are mainly trade winds.

Types of deserts

- **Erg** - Sandy deserts with large amounts of deposited sand.
- **Hamada - Rocky** deserts made of bare surfaces.
- **Reg** - Rocky deserts covered with angular pebbles, gravels and boulders.
- Hot continental interior deserts found on the interior of continents on the leeward sides of high mountains e.g. Sahara and Arabian Desert.
- Coastal deserts of western margins characterised by offshore trade winds and cold ocean currents e.g. Atacama of S. America, Namib in Namibia and Arizona in U.S.A.
- Mid latitude deserts of continental interiors with high summer and low winter like Gobi in C. Asia.
- Ice and snow deserts of polar lands like Greenland and Antarctica desert.

Learner's Short Notes



Tropical Desert Climate

Found on the western coasts of continents washed by cold ocean currents.

They are the following:

- a) Arabian Desert of the middle East
- b) Sahara, Kalahari and Namib deserts in Africa.
- c) Atacama Desert in S. America.

Mohave and Colorado deserts of U.S.A. and Mexican deserts in N and C America.

- d) Jordan, Syria, Iran, Iraq, Saudi Arabia, Israel and Afghanistan.
- e) The great Australian desert in the greater western part of the continent.

Characteristics

- a) High temperatures during the day and very low temperatures during the night due to high terrestrial radiation.
- b) Large diurnal range of temperature.
- c) Clear/ cloudless skies.
- d) Receives less than 250mm of rainfall annually.
- e) Rainfall is localized, short and torrential and accompanied by storms which cause flash floods.
- f) Rain falls for a short period and the rest of the year or even several years are dry.
- g) High wind velocity due to little frictional force.
- h) Some areas experience temperatures below zero in winter with ice forming on the oasis.
- i) Humidity is low and evaporation rate is high.
- j) Sand storms are very common i.e. sand being blown through the air by the wind.

Learner's Short Notes



Warm Climates

They border tropical climates and they experience moderate temperatures lower than of tropical climates.

They are situated in the zone of divergence of trade winds and Westerlies (subtropical high pressure belt).

Subdivided into:

1. Warm temperate Western margin/Mediterranean Climate.
2. Warm Temperate Interior/continental Climate.
3. Warm temperate Eastern marginal Climate.
4. Warm temperate Deserts.

Warm Temperate Western Margin

Also known as *Mediterranean Climate*.

Found on the western margin or sides of continents in the following areas.

- i) Southern Europe and N. Africa in the lands bordering Mediterranean Sea.
- ii) S.W tip of Africa around Cape Town.
- iii) Central Chile in S America.
- iv) S.W and S Australia.

Characteristics

- a) Hot summers with temperatures of about 21°C.
- b) Mild winters with temperatures of about 10°C.
- c) Characterized by hot and cold local winds called Mistral and Sirocco.
- d) There is high sunshine duration and intensity in summer.
- e) Experiences cyclonic rainfall in winter when Westerlies are onshore.
- f) Rainfall decreases inland.
- g) Summers are dry due to trade winds blowing offshore.
- h) There are distinct seasons i.e. summer, autumn, winter and spring.

Learner's Short Notes



Warm temperate Interior Climate

Also called *Steppe Type*.

It's found in the interior of continents in the following areas (grasslands):

- a) Steppe Land of U.S.S.R.
- b) Veldt of S Africa.
- c) Prairie lands of Canada and U.S.A.
- d) Pampas lands of Argentina.
- e) Downs of Australia.

Characteristics

- Warm short temperatures between 18-21°C.
- Long winters with extremely low temperatures due to continentality which can fall up to -20°C.
- Precipitation is received all the year round.
- Most rainfall is received in summer and snow precipitation in winter.
- Rainfall is moderate with annual mean of 500mm.
- Summer rainfall is caused by convection and depressions.
- There is high humidity in summer.

Warm temperate Eastern Margin climate

Also known as *China Type*.

It's experienced on the eastern margins of continents in the following areas.

- a) S.E China and S. Japan.
- b) S.E Australia.
- c) S and S.E states of U.S.A.
- d) S. America in S. Brazil, Uruguay, E. Paraguay and coast of Argentina.

Learner's Short Notes



Characteristics

- Hot summers with a mean annual of about 26°C.
- Mild to cool winters due to marine influence and local winds (4-13°C).
- Receives rainfall throughout the year (about 1000mm). experiences hurricanes and typhoons.
- Convictional rainfall is common in summer.
- Rainfall is moderate between 760 and 1500mm.

Warm Temperate Deserts

Also known as Mid-Latitude Desert climate.

It's experienced in the following areas:

- i) Nevada and Utah states of U.S.A.
- ii) Patagonia in S. America.
- iii) Gobi Desert extensive desert area of southern Mongolia and northern China and the largest desert in Asia.
- iv) Turkey, Turkmenistan, Uzbekistan and Kazakhstan.

Characteristics

- i. High summer temperatures (27-37°C).
- ii. Cold winters as low as -7°C.
- iii. Very large diurnal and annual ranges of temperature.
- iv. Low and unreliable rainfall due to great distance from the sea about 250 mm annually.
- v. Most rainfall falls in late winter or early spring.

Learner's Short Notes



Cool Climates

They differ from warm climates by having definite seasonal variations in temperature.

Subdivided into:

- Cool Temperate Western Margin
- Cool Temperate Continental Interior
- Cool Temperate Eastern Margin

Cool Temperate Western Margin Climate

Also known as *British Type*.

It's under coastal influence.

Found in the following areas:

- a. British Isles (Island)
- b. Central and N.W Europe
- c. N.W U.S.A. and British Columbia in Canada.
- d. S. Chile
- e. Tasmania in Australia

Characteristics

- i) Warm summers (13-15°C).
- ii) Cool winters (2-7°C).
- iii) Small temperature range.
- iv) Well distributed rainfall throughout the year (760-2000mm).
- v) Cyclonic rainfall in the coastal lands and relief rainfall in mountainous areas.
- vi) High humidity in winters.
- vii) Long summer days with irregular thunderstorms.
- viii) Convergence of sub-tropical and polar air masses.
- ix) Onshore westerly winds are dominant.

Learner's Short Notes



Cool Temperate Continental Interior Climate

Also called *Siberian type*.

Found in the following areas:

- Alaska and most of Canada
- Eurasia covering Sweden, Finland, Poland, Germany, across former U.S.S.R. up to Kamchatka Peninsular in the east.

Characteristics

- Warm summers with temperatures of about 18°C.
- Generally short summers.
- Extremely cold winter temperatures which go below 20°C.
- Long winters with long nights.
- Precipitation is mainly in form of snow during winter (annual precipitation 400-500mm).
- Convictional rainfall in summer is accompanied by thunderstorms.

Cool Temperate Western Margin Climate

It's also known as *Laurentian Type*.

Areas:

- N. U.S.A. and S Canada.
- S. Argentina.
- N & S Korea, N. China, C and N Japan and E. Siberia.

Characteristics

- Long warm summers with temperatures of about 18°C.
- Cold winters (-40-0°C).
- Precipitation all year round (600-1000mm).
- Snow precipitation in winter.
- High humidity in summer.

Learner's Short Notes



Cold Climates

Also known as *Polar Desert Climates* or *Arctic* and *Antarctic Climates*.

Found beyond Arctic Circle i.e. $66\frac{1}{2}^{\circ}\text{N}$ and S of equator.

Classified into **Tundra** and **Polar** Climates.

Tundra Climate

Areas:

- a. Coast of N. America bordering Arctic Ocean.
- b. N part of America from Alaska through Canada to Greenland.
- c. From N coast of Scandinavia to the N.E of Russia.
- d. Baffin Island.

Characteristics

- i) Short cool summers with average temperatures of about 10°C .
- ii) Long cold winters (-29 - -40°C).
- iii) Continuous days in winter and summer for several days.
- iv) Low annual precipitation of about 250mm.
- v) Precipitation in form of rain and snow in winter.

Polar Climate

Experienced at the poles in the interior of Iceland, Green land and Antarctica.

Characteristics

- Temperature is permanently below freezing point.
- There is permanent snow cover and ice on the ground (permafrost).
- Snow storms (blizzards) are common.
- Continuous winter nights and summer days with exception of equinox when sun rises above horizon.

Mountain Climates

Experienced on high mountain ranges of the world.

Learner's Short Notes



Areas:

- a. Mt. Kenya (5199)
- b. Mt. Ruwenzori (5109)
- c. Mt. Kilimanjaro (5895)
- d. Mt. Everest (8848)
- e. Atlas mountains in Africa
- f. Rockies of N. America
- g. Alps of Europe
- h. Himalayas in Asia

Characteristics

1. Temperature decreases with increasing altitude.
2. Temperature ranges from cool to cold.
3. Experiences Orographic rainfall.
4. Rainfall increases with altitude up to 3000mm and starts to decrease because air is cold and hence has poor capacity to hold moisture.
5. Windward slopes are wetter than leeward slopes.
6. Atmospheric pressure decreases with increasing altitude.
7. Local winds are common and blow up the slope during the day and down slope at night.
8. In temperate regions slopes facing the equator are warmer than those facing the poles.
9. Atlas mountains in Africa
10. Rockies of N. America
11. Alps of Europe
12. Himalayas in Asia

Local/Micro Climates

Climate experienced within a small area which is slightly different compared to the general climate of the area.

It occurs on the immediate surroundings and within some phenomenon on the earth's surface.

Micro-climates can be found in the following areas:

Learner's Short Notes



a) **Within and around a forest**

- Experience low temperatures due to trees preventing solar insolation from reaching the ground.
- Experiences high rainfall due to high rates of evapotranspiration.

b) **Urban areas**

- Higher temperatures due to green house effect (situation where atmospheric gases absorb heat that is given off by the earth (terrestrial radiation) before its sent back to space causing the temperature of the lower atmosphere to increase.

c) **Around man made lakes**

- Experience high convectional rainfall due to high moisture content.
- Around natural lakes experiences land breezes which cause early morning showers and sea breezes which lower temperatures during the hot season.

Aridity and Desertification

Aridity-state of land being deficient of moisture leading to little or no vegetation.

Desertification-process in which desert like conditions slowly and steadily encroach on formerly productive agricultural land.

Causes of Aridity and Desertification

1. Low and unreliable rainfall below 250mm per annum causing little or no vegetation and absence of animal and biological life causing soil forming processes to be incomplete.
2. High temperatures which cause high rates of evaporation which exceed evaporation or low temperatures which reduces air capacity to hold moisture causing a place to receive little or no rain..
3. Where a place is washed by ocean currents causing moist onshore winds to cool and then drop moisture over the sea and reach the land as dry winds e.g. Kalahari when onshore westerlies cross the cold Benguela Current.
4. Where relief barriers such as hills or mountains cause some areas to lie on the rain shadow hence rain winds drop most of their moisture on the windward side and they drop on the leeward side, are warmed and hold onto moisture causing dry conditions e.g. Kalahari and Namib on the rain shadow of Drakensberg mountains.

Learner's Short Notes

5. Location of some places very far from the sea causing them to be far removed from wet onshore winds e.g. Gobi Desert.
6. Where hot dry winds blow over a region causing drying effect on land e.g. Harmattan over West Africa.
7. Where cool air descends causing no rain because cool air has to rise before condensation takes place.

Human Activities

8. When people clear forests which causes runoff to exceed infiltration which interferes with the water cycle.
9. Keeping large number of animals which exceed the carrying capacity of land they eat vegetation leaving the land bare exposing the land to soil erosion.
10. Poor agricultural practices such as overcultivation, monoculture and slashing and burning which lead to soil erosion.
11. Industrialization which releases green house gases such as CO₂ to the atmosphere which absorb more heat making the earth's temperature to rise.
12. Reclamation of water logged areas which lowers the water table causing arid conditions to set in plants when plants can't access ground water.
13. Poor irrigation methods when evaporation takes place and salt from below are brought to the surface and are deposited on the top soil making the soil salty and hence unable to support plants.

Effects of Aridity and Desertification

1. Infertile soils which support little or no vegetation.
2. Low agricultural production due to insufficient rainfall leading to famine.
3. Shortage of water for domestic and industrial use which may also lead to shutting down of many businesses.
4. Migration of people from areas affected by aridity and desertification leading to population pressure and eventually conflicts.
5. Destruction of vegetation which exposes land to soil erosion.
6. Can lead to extinction of some plants and animal species causing loss of biodiversity.

Learner's Short Notes

Solutions to Aridity and Desertification

1. Afforestation and reforestation because trees protect soil from erosion, increase run off and release moisture to the atmosphere leading to increased rainfall.
2. Adopting soil conservation measures such as terracing, contour ploughing, planting cover crops etc.
3. Rearing a number of animals which is proportional to the carrying capacity of land.
4. Irrigating dry lands.
5. Introduction of energy saving stoves to reduce demand for wood fuel which will reduce deforestation.
6. Use of alternative sources of energy which don't pollute the environment e.g. solar and water.
7. Introducing drought resistant crops in the arid areas.
8. Controlling industrialization by setting laws governing pollution.

Climate Change

Establishment of a new climatic state.

Continuous changes in climatic states such as temperature and precipitation over time.

Causes of Climate Change

Natural Causes

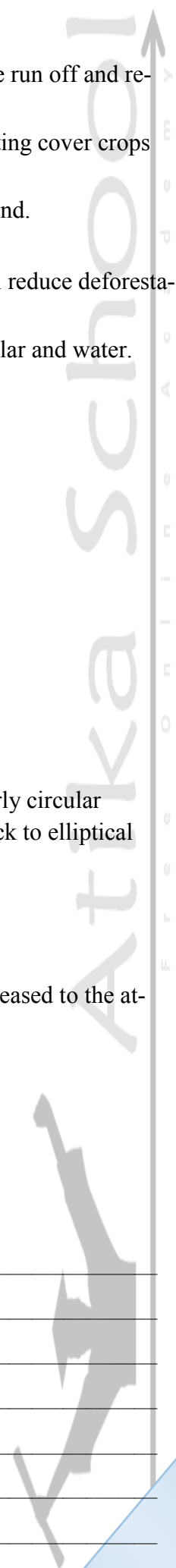
1. Variations in the Earths Orbital Characteristics

Changing or earths orbital characteristics within 1000 years from elliptical (aphelion) to nearly circular (perihelion) when the earth is nearest to the sun and receives maximum solar energy and back to elliptical when the earth is farthest from the sun and receives least solar energy.

2. Variation in the Atmospheric Carbon Dioxide

When natural rise in temperature cause carbon dioxide held up in cold ocean waters to be released to the atmosphere after oceans warmed.

Learner's Short Notes



3. Volcanic Eruptions

- When large quantities of volcanic ash and dust thrown out of the ground block some of the solar insolation from reaching the earth's surface causing temperatures on the earth's surface to drop for a short period.
- When sulphur dioxide given off during volcanic eruptions reacts with water vapour forming a bright layer within stratosphere reducing the amount of solar radiation reaching the surface by reflecting some of it back which also lowers temperatures on the surface.

4. Variation in Solar Output

Changes in the amount of solar energy given off by the sun whereby at times it's less causing drop of temperature on the earth's surface and at others it gives off more causing rise in temperature on the surface.

Human Causes

1. Burning of fossil fuels in industries, transportation, electricity generation etc. which contributes 65% of additional CO₂ in the atmosphere which is the main green house gas.
2. Burning of vegetation e.g. in shifting cultivation and forest fires which also adds CO₂ in the atmosphere.
3. Clearing large tracts of forests for agriculture, settlement etc. which reduces the main disposal system for CO₂ from the atmosphere by photosynthesis.
4. Industrial developments which add gases like methane, nitrous oxide and those containing chlorine and chlorofluorocarbons which damage the ozone layer which filters a greater percentage of ultra violet radiation given off by the sun which causes the average temperatures on the earth to rise.

Consequences of Climate Change

1. Global warming due to green house effect by gases added in to the atmosphere and destruction of ozone layer.
2. Increased rainfall as a result of high temperatures causing high rates of evaporation causing wet areas to become wetter and dry areas to become drier.
3. Effect on agriculture by causing crop growing areas to shift to cooler altitudes and latitudes e.g. wheat growing areas of Canada shifting to the poles and causing dropping or failure of crop yields in areas where temperatures have increased.

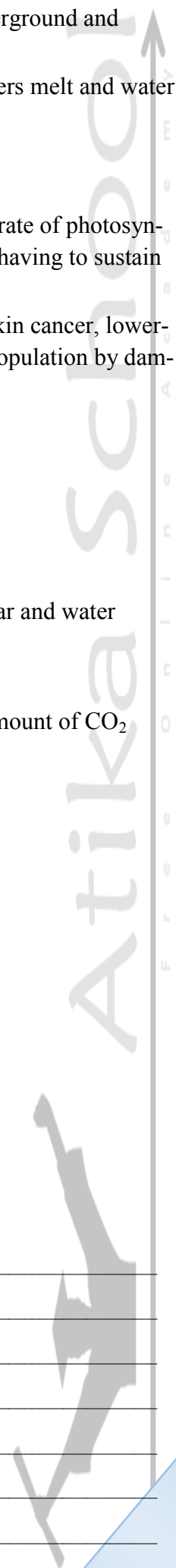
Learner's Short Notes

5. Water shortage when climate becomes drier causing less water to infiltrate underground and hence less water to feed rivers.
6. Submergence of coastal areas causing flooding when Antarctic and Arctic glaciers melt and water is added to the oceans.
7. Heat waves due to increased temperature which leads to death of people.
8. Receding and disappearance of ice caps on mountains e.g. Mt. Ruwenzori.
9. Abnormal growth of plants due to increased amounts of CO₂ causing increased rate of photosynthesis which may lead to increased yields of major crops, poor soils due to soils having to sustain high rates of plant growth.
10. increased levels of ultra violet radiation which causes human diseases such as skin cancer, lowering crop production by slowing photosynthesis and germination, lowering fish population by damaging plankton which fish eats and degradation of paint and plastics.

Solution to Climate Change

- a) Afforestation and reforestation.
- b) Use of energy saving stoves to reduce the rate of deforestation.
- c) Use of alternative sources of energy which are environmentally friendly e.g. solar and water instead of fossil fuels.
- d) Proper maintenance of vehicle to reduce emissions from their exhausts.
- e) Use of public transport to reduce the amount of fossil fuel used and hence the amount of CO₂ added into the atmosphere.

Learner's Short Notes



PAST KCSE TESTED QUESTIONS

CLIMATE.

1. (a) (i) What is climate? (2mks)

(ii) Explain two effects of climate change on the physical environment

2. The table below represents rainfall and temperature figures for a town in Africa. Use it to answer the questions that follow

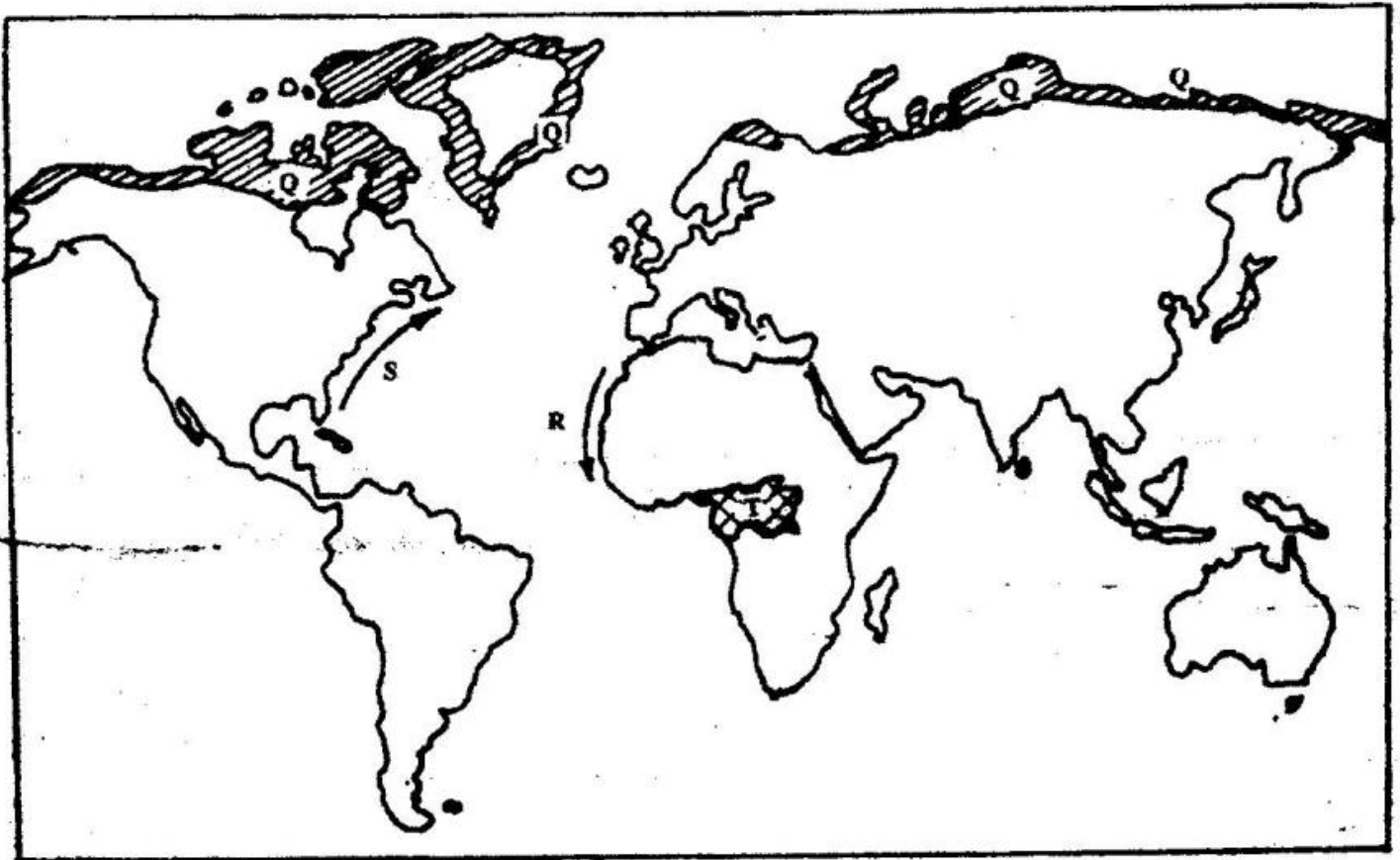
Month	J	F	M	A	M	J	J	A	S	O	N	D
Temp (0C)	27	28	28	28	27	25	25	24	25	26	27	26
Rainfall (mm)	25	38	99	140	277	439	277	69	142	201	71	25

(a) Calculate the annual range of temperature for the town (2mk)

(b) Calculate the total annual rainfall for the town. (2mks)

(c) State two characteristics of the climate experienced in the town. (2mks)

3. Use the map below to answer questions (a) and (b)



(a) Name:

(i) The type of climate found in the shaded area marked Q (1mk)

(ii) The ocean current marked R and S (2mks)

(b) Describe the characteristics of the type of climate found in the shaded area marked T (8mks)

(c) Explain how the following factors influence climate

(i) Altitude (4mks)

(ii) Distance from the sea (4mks)

(d) (i) Describe a suitable site where you would locate a weather station in your School (2mks)

(ii) Give reasons why a Stevenson's screen is:

- Painted White (2mks)

- Has louvers (2mks)

4. Describe the characteristics of natural vegetation associated with equatorial climate (4mks)

5. Give five characteristics of hot desert climate (5mks)

6. How does the following factors influence climate?

(i) Wind/air masses.

(ii) Latitude.

7. Explain characteristics of climatic conditions experienced in the Kenyan highlands. (8mks)

8. Explain four ways in which mountains influence climate. (8mks)

9. What is greenhouse effect? (2mks)

10. How do human activities influence climate change? (6mks)

11. How does clearance of vegetation cause climate change? (3mks)

12. Define climate. (2mks)

13. What is isothermal layer? (2mks)



MARKING SCHEME

- 1.
- a) Climate is the average weather conditions of atmosphere of a place for a long time usually 30 to 35 years.
- b) Disruption of natural ecosystems due to ecological changes that affect existence of some organisms and resources.
- (ii) Abnormal fast growth of plants due to increased carbon dioxide
 - (iii) Flooding from rising sea due to melting or anteretic ice.
 - (iv) Increased rainfall to between 7% and 11% annually due to increased rate of evaporation.
 - (v) Severe draughts due to reduced rainfall.
- 2.
- a) $280C - 240C = 40$
- b) -1803 mm
- c)
- The town experiences high temperatures throughout the year.
 - The annual range of temperature is small about 40C.
 - The rainfall pattern has double maxima.
 - The wettest month is June/the driest months are December and January.
 - The total annual rainfall is high 1803mm.
3. a)
- (i) Polar climate
- (ii)
- R - Canary current
S - Gulf stream current
- b)
- High temperatures all year about 270C
 - Low diurnal range of temperature of approximately 60C
 - High rainfall of between 1500mm and 2000mm throughout the year.
 - High humidity due to high rainfall and high evaporation
 - Major winds are S. east and North East trade winds
- Thick cloud covers throughout the year.
 - Rainfall is mainly convectional accompanied by thunderstorms
 - Long hours of sunshine.
 - Low atmospheric pressure.
- c)
- (i) How altitude influences climate.
- Temperature decreases with increase in height above sea level. This is because atmospheric air is denser at low altitude than high altitude.
 - There is grater heat loss at high altitude due to few obstacles to interfere with outgoing terrestrial radiation hence low temperatures.
 - Air pressure is higher in the lowlands due to greater weight of air above.
- ii) Distance from the sea
- During summer cooler winds from the sea are onshore and modify temperature of
 - The coastal land.
 - During winter the sea water which is relatively warmer than land brings warming effect to the coastal land therefore modifying temperature.
 - Onshore winds carry a lot of moisture from the sea bringing rainfall to coastal lands.
- 4.
- i) Characteristics of natural vegetation associated with equatorial climate.
- ii) The natural vegetation is equatorial rain forest vegetation.
- iii) Growth of this vegetation is due to high rainfall well distributed throughout the year.
- iv) Forests consist of tall trees with straight and smooth stems. The trees reach great height of 40 metres because of competition for sunlight.

- v) The trees form canopy.
- vi) Forest is characterized by close growth of trees of different species.
- vii) Trees have broad leaves drip-tip in shape.
- viii) Many trees have buttress root system mainly for support.
- ix) Forest is evergreen

5. Five characteristics of hot desert climate

- a) Low annual rainfall less than 250mm/dry climate.
- b) Occasional flash floods/sporadic rains
- c) Clear sky/clear sunny days/high terrestrial radiations.
- d) High temperature during the day.
- e) Relatively low temperatures during the night/high diurnal range.
- f) Strong winds
- g) Low humidity
- h) High evaporation
- i) Unreliable rainfall

6. How following factors influence climate:

i) Wind/air masses

- Warm winds bring warming influence in the cool lands leading to warming effects
- Areas under influence of dry winds have little or no rainfall while areas under moist winds are usually wet.

ii) Latitude

- Areas near equator are hotter than areas far away from equator. This is due to concentration of sun rays per unit area at the equator.
- Amount of solar radiation and temperatures decreases downwards

7. Climatic conditions experienced in the Kenyan highlands.

- (i) Region receives rainfall throughout the year
- (ii) Total rainfall ranges from 1000mm to 1500mm
- (iii) The region has double maxima in east and single maximum in west

- (iv) Rainfall is higher on the windward slopes than on leeward slopes
- (v) Rainfall is higher on the windward slopes.
- (vi) Rainfall is caused mainly by S.E trade winds.
- (vii) Average temperature ranges between 170C to 240C.
- (viii) Area receives mainly relief rainfall.

8.

- a. Because of aspect slopes facing the sun are warm than slopes facing the opposite direction.
- b. The mountains cause anabatic winds which have a cooling effect on hill side during the day. Valley bottoms katabatic winds brings effect during the night
- c. Reduction of air pressure with increase in altitude
- d. Occurrence of relief rainfall on windward side as an influence of relief.

9. Green house effect is a condition where incoming solar radiation passes through the atmosphere while outgoing terrestrial radiation is blocked by gases and clouds in the atmosphere. This makes earth to retain much of terrestrial radiation therefore becoming warmer.

10. Climate change due to human activities

- Burning of fossil fuels
- Forest and grassland fires
- Industrial and agricultural development.

11. Clearance of vegetation reduces disposal of carbon dioxide from the atmosphere by photosynthesis. Due to inadequate vegetation that would otherwise utilize CO₂ in photosynthesis, there is build up of excess carbon dioxide gases in the atmosphere leading to global warming.

12. Climate- is the average weather conditions of a place or region which have been observed for long period of time usually 30-35 years.

13. Isothermal layer – is a layer within atmosphere within which temperature remains constant despite increasing height.