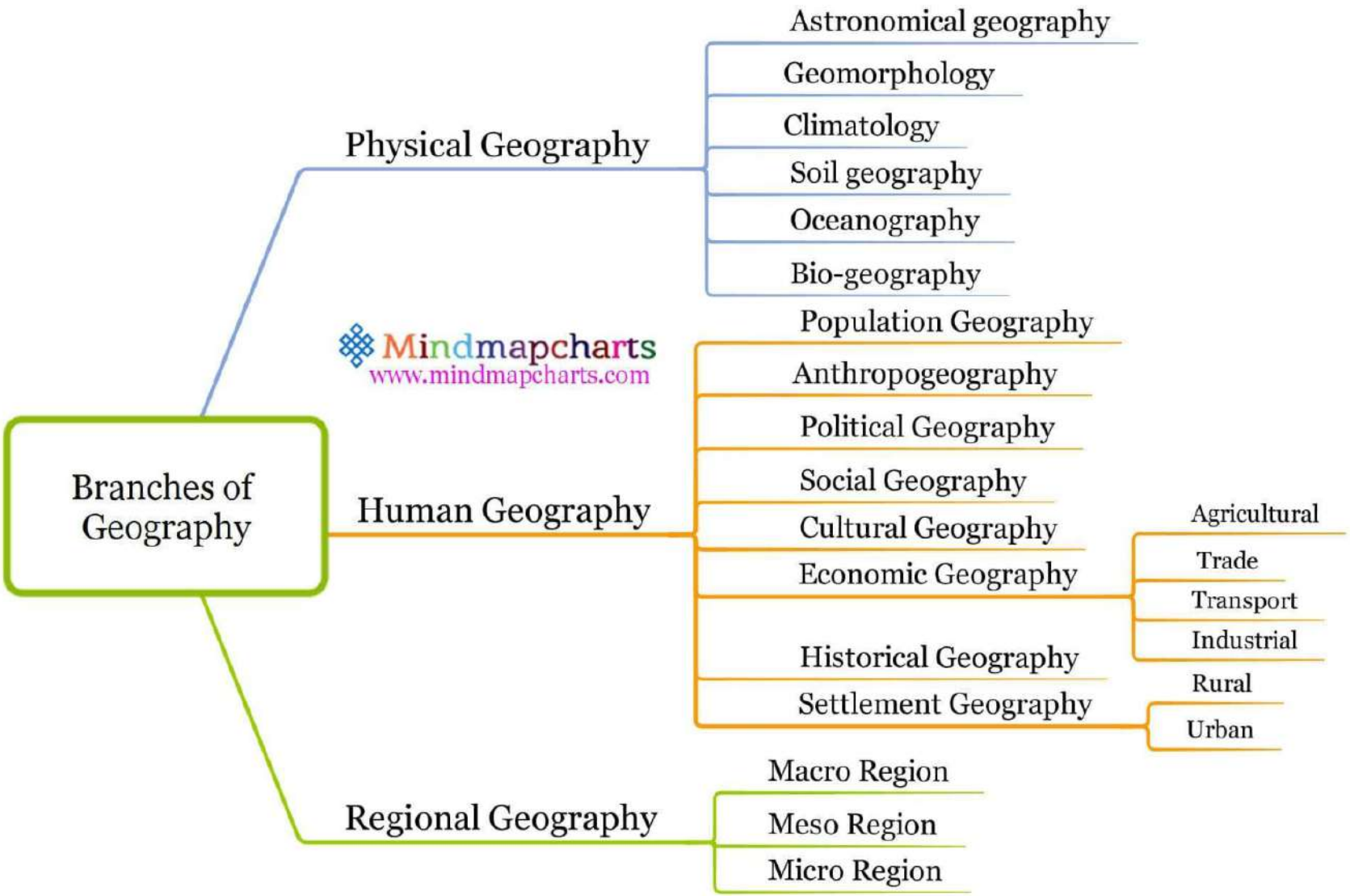
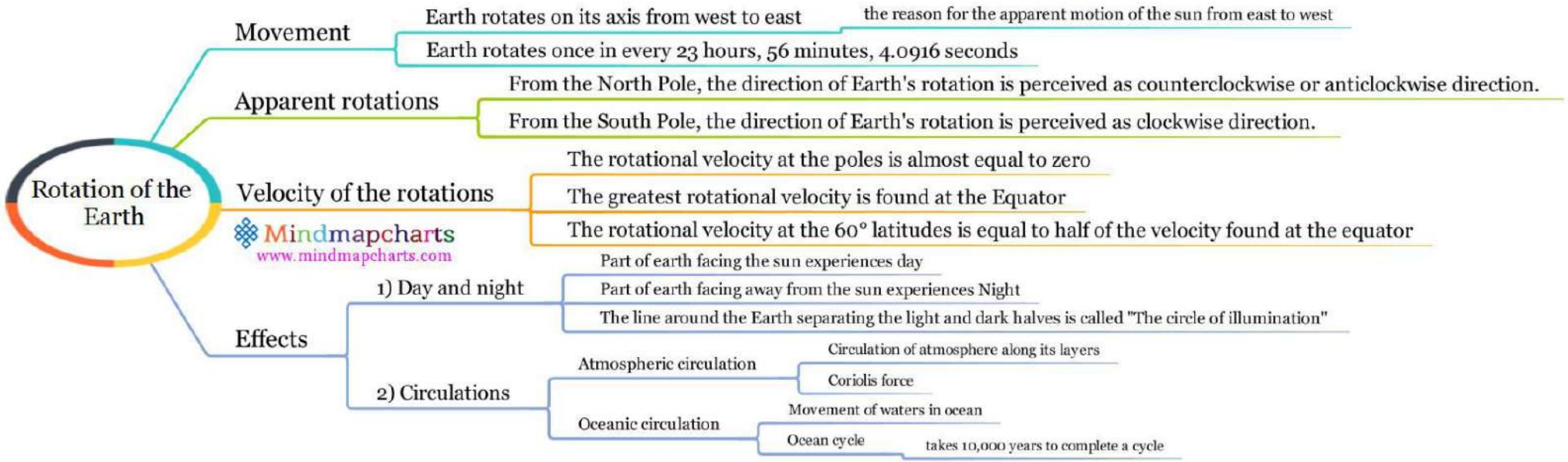
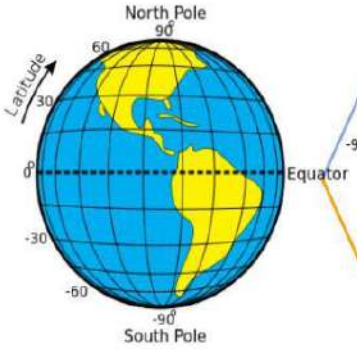
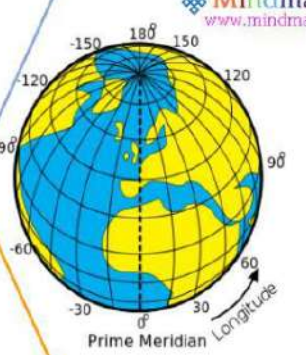

Branches of Geography
Physical Geography
Astronomical geography
Geomorphology
Climatology
Soil geography
Oceanography
Bio-geography
Mindmapcharts
www.mindmapcharts.com
Human Geography
Population Geography
Anthropogeography
Political Geography
Social Geography
Cultural Geography
Economic Geography
Agricultural
Trade
Transport
Industrial
Historical Geography
Settlement Geography
Rural
Urban
Regional Geography
Macro Region
Meso Region
Micro Region

- shape of the earth
  - Oblate spheroid
    - slightly flattened at the poles and bulging at the equator.
- Layers of the Earth
  - 1. Crust
    - Outermost layer of the Earth
      - 1. Continental crust
      - 2. Oceanic crust
    - Composition
      - made of solid rocks
      - made of the lighter elements
        - silicon, aluminium and oxygen
        - known as **sial or felsic.**
      - Elements by percentage
        - 1. Oxygen 47%
        - 2. Silicon 28%
        - 3. Aluminium 8%
        - 4. Iron 5%
        - 5. Calcium 3.5%
      - Compounds by percentage
        - 1. Silica
        - 2. Alumina
        - 3. Lime
  - 2. Mantle
    - layer below the crust
    - Composition
      - Made of
        - silicon, oxygen and Magnesium
        - known as **sima or mafic**
      - The density of the Mantle increases gradually with depth.
    - Layers
      - 1. Upper mantle
        - solid base of the crust
        - made of the heavy rock peridotite.
      - 2. Upper aesthenosphere
        - layer is fluidic due to high pressure and temperature
        - leads to movement of continental plates
      - 3. Lower aesthenosphere
      - 4. Lower mantle
  - 3. Core
    - Innermost layer of the earth
    - Composition
      - core is made of solid iron and nickel
      - known as **nife**
    - Layers
      - 1. Outer core
        - molten layer below the mantle
      - 2. Inner core
        - Solid
        - due to high pressure
- Discontinuities
  - are the boundaries between layers of earth
    - found by analysis of the seismic waves
  - 1. Conrad discontinuity
    - Between Upper crust and Lower crust
    - named after Victor Conrad
  - 2. Mohorovicic discontinuity
    - Between Crust and Aesthenosphere
    - named after Andrija Mohorovicic
    - It lies at a depth of about
      - 20 miles under the continents
      - 4 to 6 miles under the oceans.
  - 3. Repetti discontinuity
    - Between the upper mantle and the lower mantle
  - 4. Gutenberg discontinuity
    - Between lower mantle and the core
  - 5. Lehman discontinuity
    - Between outer core and the inner core
- Important points
  - Lithosphere = Crust + Upper mantle
    - Oceanic lithosphere
    - Continental lithosphere
  - Thickness of continental crust is higher than oceanic crust
  - Mantle is the largest layer by mass and volume, followed by crust and core respectively
  - Earth's density increases gradually from crust to core
  - Oceanic crust is denser than continental crust


Rotation of the Earth
Movement
Earth rotates on its axis from west to east
the reason for the apparent motion of the sun from east to west
Earth rotates once in every 23 hours, 56 minutes, 4.0916 seconds
Apparent rotations
From the North Pole, the direction of Earth's rotation is perceived as counterclockwise or anticlockwise direction.
From the South Pole, the direction of Earth's rotation is perceived as clockwise direction.
Velocity of the rotations
The rotational velocity at the poles is almost equal to zero
The greatest rotational velocity is found at the Equator
The rotational velocity at the 60° latitudes is equal to half of the velocity found at the equator
Mindmapcharts
www.mindmapcharts.com
Effects
1) Day and night
Part of earth facing the sun experiences day
Part of earth facing away from the sun experiences Night
The line around the Earth separating the light and dark halves is called "The circle of illumination"
2) Circulations
Atmospheric circulation
Circulation of atmosphere along its layers
Coriolis force
Oceanic circulation
Movement of waters in ocean
Ocean cycle
takes 10,000 years to complete a cycle



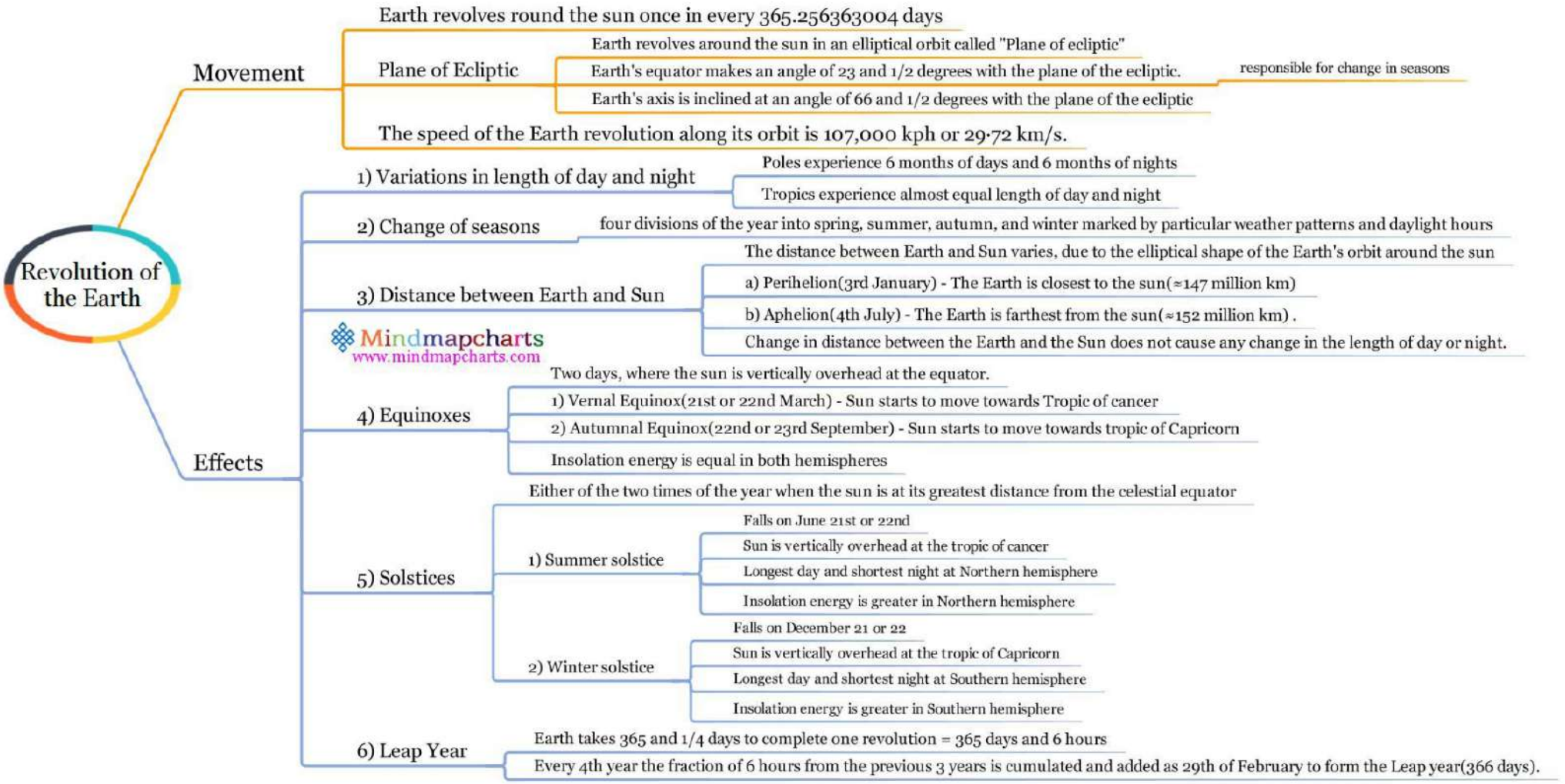


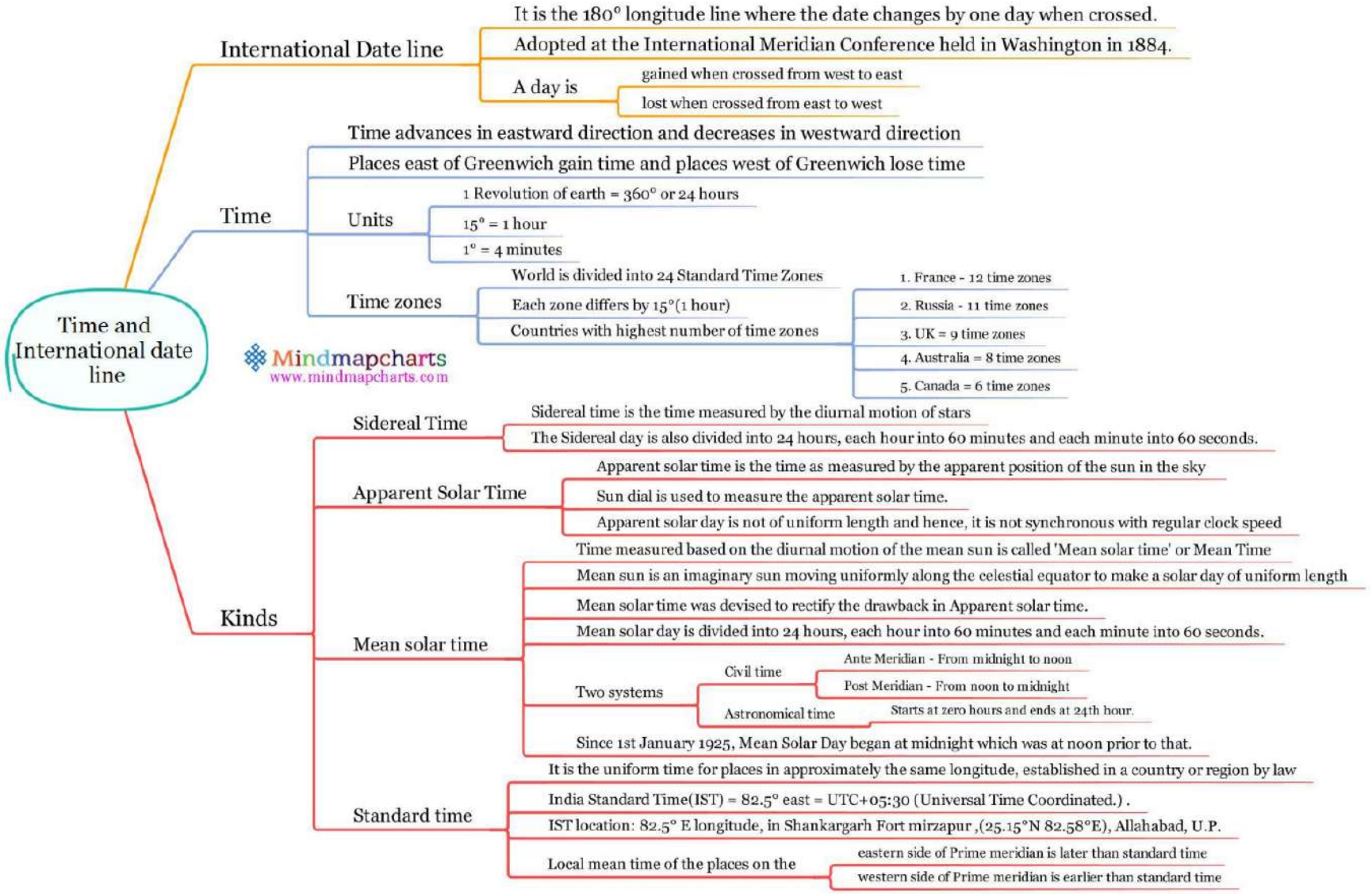
Latitude

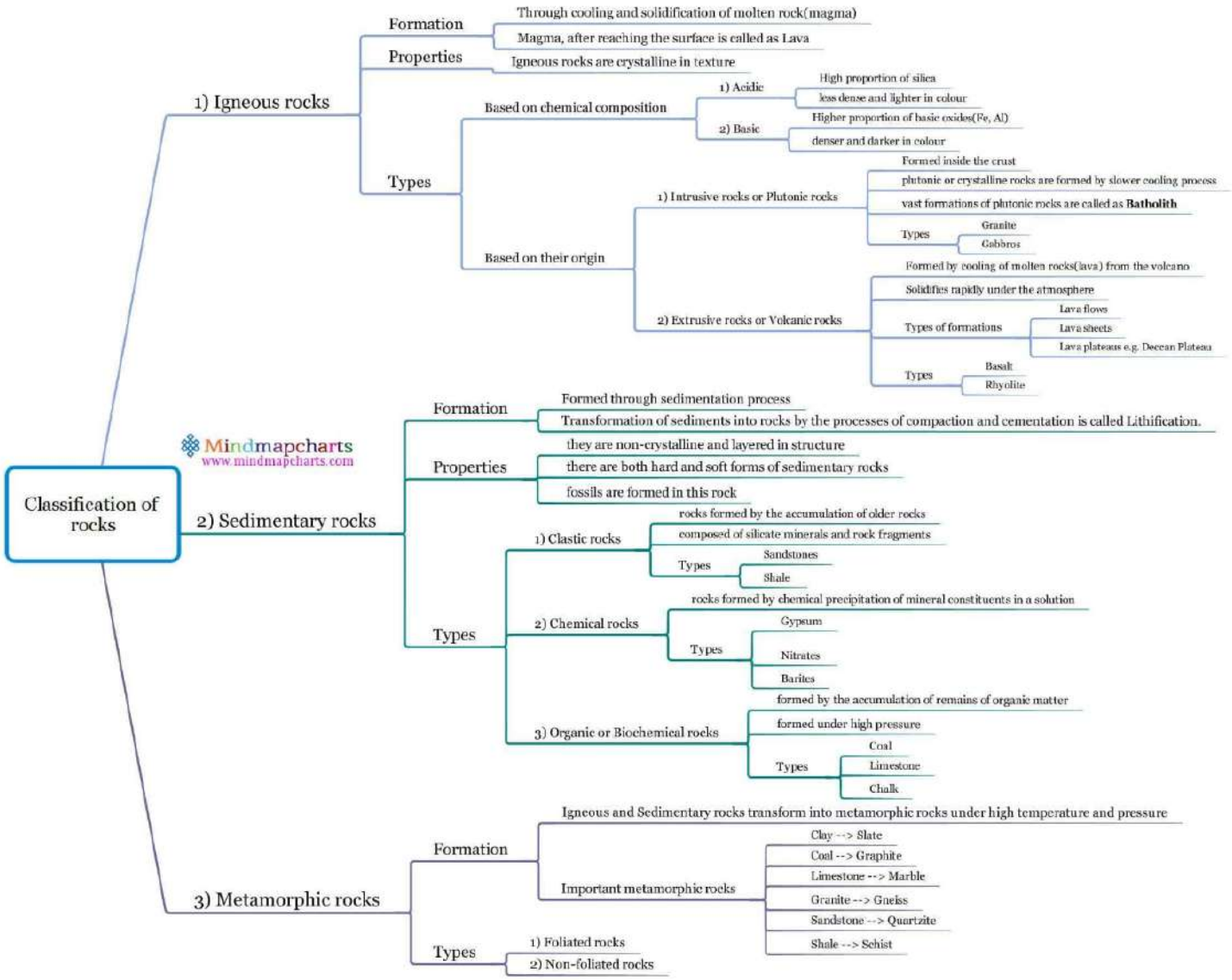
- Latitudes are imaginary lines around the Earth parallel to the equator
  - also called as 'parallels'
- Characteristics
  - Latitudes gradually decrease in size from the equator(Great circle) towards the pole
  - Degree of latitude is greater at the pole(111.7 km) than at the equator(110.7 km)
- Measurements
  - Latitude of a place is the angular distance measured either north or south from the equator
  - Distance between the latitudes are constant
  - The length of 60° latitude is half the length of the Equator.
  - The length of 75° latitude is 1/4th of the length of the Equator.
- Important Latitudinal lines
  - Arctic circle - 66 1/2° N
  - Tropic of cancer - 23 1/2° N
  - Equator - 0°
    - largest of all latitudes
    - also called as zero degree latitude
  - Tropic of Capricorn - 23 1/2° S
  - Antarctic circle - 66 1/2° S
- Sample Calculation
  - What is the distance 12 degrees north of equator?
  - Solution: 12 x 111.044(average value of a degree latitude) = 1332.5 km

Longitude

- Longitudes are series of semi-circles passing from north to south direction crossing the equator
  - also known as Meridians
- Characteristics
  - All meridians are equal in length
  - Meridians extend up to 180° from the east and west of Prime meridian
  - All meridians cross the equator at right angle
  - Degree of longitude is greater at the equator(111.3 km) and decreases gradually towards the Pole(0 km)
- Zero degree meridian or Prime Meridian
  - Chosen in 1884
  - Prime meridian divides the sphere into two hemispheres
  - Passes through the Royal Astronomical Observatory at Greenwich, London
  - Greenwich Meridian has been adopted internationally as the Standard meridian.
- Measurements
  - Longitude of a place is the angular distance between a point on any meridian and the prime meridian at Greenwich
  - Longitude of a place is measured either east or west from the Prime meridian
  - Positive longitudes - Longitudes counted west of Prime meridian are called positive longitudes.
  - Negative longitudes - Longitudes counted east of Prime meridian are called negative longitudes.


Revolution of the Earth
Movement
Earth revolves round the sun once in every 365.256363004 days
Plane of Ecliptic
Earth revolves around the sun in an elliptical orbit called "Plane of ecliptic"
Earth's equator makes an angle of 23 and 1/2 degrees with the plane of the ecliptic.
Earth's axis is inclined at an angle of 66 and 1/2 degrees with the plane of the ecliptic
responsible for change in seasons
The speed of the Earth revolution along its orbit is 107,000 kph or 29·72 km/s.
Effects
1) Variations in length of day and night
Poles experience 6 months of days and 6 months of nights
Tropics experience almost equal length of day and night
2) Change of seasons
four divisions of the year into spring, summer, autumn, and winter marked by particular weather patterns and daylight hours
3) Distance between Earth and Sun
The distance between Earth and Sun varies, due to the elliptical shape of the Earth's orbit around the sun
a) Perihelion(3rd January) - The Earth is closest to the sun(≈147 million km)
b) Aphelion(4th July) - The Earth is farthest from the sun(≈152 million km) .
Change in distance between the Earth and the Sun does not cause any change in the length of day or night.
Mindmapcharts
www.mindmapcharts.com
4) Equinoxes
Two days, where the sun is vertically overhead at the equator.
1) Vernal Equinox(21st or 22nd March) - Sun starts to move towards Tropic of cancer
2) Autumnal Equinox(22nd or 23rd September) - Sun starts to move towards tropic of Capricorn
Insolation energy is equal in both hemispheres
5) Solstices
Either of the two times of the year when the sun is at its greatest distance from the celestial equator
1) Summer solstice
Falls on June 21st or 22nd
Sun is vertically overhead at the tropic of cancer
Longest day and shortest night at Northern hemisphere
Insolation energy is greater in Northern hemisphere
2) Winter solstice
Falls on December 21 or 22
Sun is vertically overhead at the tropic of Capricorn
Longest day and shortest night at Southern hemisphere
Insolation energy is greater in Southern hemisphere
6) Leap Year
Earth takes 365 and 1/4 days to complete one revolution = 365 days and 6 hours
Every 4th year the fraction of 6 hours from the previous 3 years is cumulated and added as 29th of February to form the Leap year(366 days).


Time and International date line
International Date line
It is the 180° longitude line where the date changes by one day when crossed.
Adopted at the International Meridian Conference held in Washington in 1884.
A day is
gained when crossed from west to east
lost when crossed from east to west
Time
Time advances in eastward direction and decreases in westward direction
Places east of Greenwich gain time and places west of Greenwich lose time
Units
1 Revolution of earth = 360° or 24 hours
15° = 1 hour
1° = 4 minutes
Time zones
World is divided into 24 Standard Time Zones
Each zone differs by 15°(1 hour)
Countries with highest number of time zones
1. France - 12 time zones
2. Russia - 11 time zones
3. UK = 9 time zones
4. Australia = 8 time zones
5. Canada = 6 time zones
Mindmapcharts
www.mindmapcharts.com
Kinds
Sidereal Time
Sidereal time is the time measured by the diurnal motion of stars
The Sidereal day is also divided into 24 hours, each hour into 60 minutes and each minute into 60 seconds.
Apparent Solar Time
Apparent solar time is the time as measured by the apparent position of the sun in the sky
Sun dial is used to measure the apparent solar time.
Apparent solar day is not of uniform length and hence, it is not synchronous with regular clock speed
Mean solar time
Time measured based on the diurnal motion of the mean sun is called 'Mean solar time' or Mean Time
Mean sun is an imaginary sun moving uniformly along the celestial equator to make a solar day of uniform length
Mean solar time was devised to rectify the drawback in Apparent solar time.
Mean solar day is divided into 24 hours, each hour into 60 minutes and each minute into 60 seconds.
Two systems
Civil time
Ante Meridian - From midnight to noon
Post Meridian - From noon to midnight
Astronomical time
Starts at zero hours and ends at 24th hour.
Since 1st January 1925, Mean Solar Day began at midnight which was at noon prior to that.
Standard time
It is the uniform time for places in approximately the same longitude, established in a country or region by law
India Standard Time(IST) = 82.5° east = UTC+05:30 (Universal Time Coordinated.) .
IST location: 82.5° E longitude, in Shankargarh Fort mirzapur ,(25.15°N 82.58°E), Allahabad, U.P.
Local mean time of the places on the
eastern side of Prime meridian is later than standard time
western side of Prime meridian is earlier than standard time


Classification of rocks
Mindmapcharts
www.mindmapcharts.com
1) Igneous rocks
Formation
Through cooling and solidification of molten rock(magma)
Magma, after reaching the surface is called as Lava
Properties
Igneous rocks are crystalline in texture
Types
Based on chemical composition
1) Acidic
High proportion of silica
less dense and lighter in colour
2) Basic
Higher proportion of basic oxides(Fe, Al)
denser and darker in colour
Based on their origin
1) Intrusive rocks or Plutonic rocks
Formed inside the crust
plutonic or crystalline rocks are formed by slower cooling process
vast formations of plutonic rocks are called as Batholith
Types
Granite
Gabbros
2) Extrusive rocks or Volcanic rocks
Formed by cooling of molten rocks(lava) from the volcano
Solidifies rapidly under the atmosphere
Types of formations
Lava flows
Lava sheets
Lava plateaus e.g. Deccan Plateau
Types
Basalt
Rhyolite
2) Sedimentary rocks
Formation
Formed through sedimentation process
Transformation of sediments into rocks by the processes of compaction and cementation is called Lithification.
Properties
they are non-crystalline and layered in structure
there are both hard and soft forms of sedimentary rocks
fossils are formed in this rock
Types
1) Clastic rocks
rocks formed by the accumulation of older rocks
composed of silicate minerals and rock fragments
Types
Sandstones
Shale
2) Chemical rocks
rocks formed by chemical precipitation of mineral constituents in a solution
Types
Gypsum
Nitrates
Barites
3) Organic or Biochemical rocks
formed by the accumulation of remains of organic matter
formed under high pressure
Types
Coal
Limestone
Chalk
3) Metamorphic rocks
Formation
Igneous and Sedimentary rocks transform into metamorphic rocks under high temperature and pressure
Important metamorphic rocks
Clay --> Slate
Coal --> Graphite
Limestone --> Marble
Granite --> Gneiss
Sandstone --> Quartzite
Shale --> Schist
Types
1) Foliated rocks
2) Non-foliated rocks

Mountains

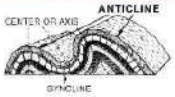
Orogeny

- Orogenesis refers to the forces and events leading to a large structural deformation of the Earth's lithosphere due to tectonic plates.
- Continental plate is crumpled and pushed upwards to form mountain ranges
- Orogenesis involves
  - Folding, faulting, volcanic activity, igneous intrusion and metamorphism to form mountains
- Forms of mountains
  - 1. Mountain ridge
    - chain of mountains or hills that form a continuous elevated crest for some distance
  - 2. Mountain range/barrier/belt/chain/system
    - geographic area containing numerous geologically related mountains
      - e.g. Himalayas, Alps, Andes etc..

Types

1) Fold Mountains

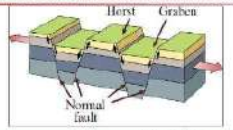
- Continental crust floating above the mantle is forced upward to form hills, plateaus or mountains
- Fold mountains are formed when
  - two plates collide under stress
  - there is an imbalance in weight of overlying rocks
  - there are variations in mantle flow
  - there is an intrusion of magma
- Fold mountains are formed under compressive forces



- Crust is folded into
  - 1) Syncline — Trough or Downfold of the crust
  - 2) Anticline — Crest or Upfold of the crust
- Many active volcanoes are found in fold mountains
- Major fold mountains
  - Himalayas in Asia
  - Alps in Europe
  - Andes in South America
  - Rockies in North America
  - Urals in Russia

2) Block or Fault mountains

- Block mountains are formed when the crust rifts or faults
- Block mountains are formed under both tension and compressive forces
- One side of the fault rises relative to the other forming a mountain



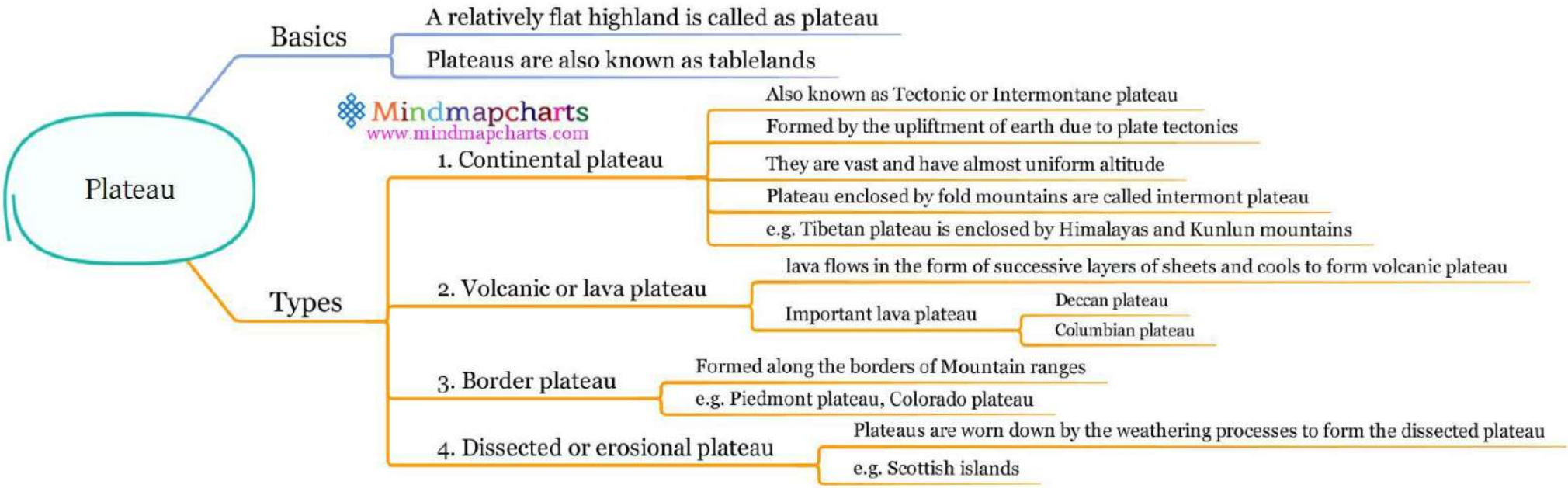
- Formations
  - The uplifted blocks form block mountains or horsts
  - The dropped blocks form graben and rift valleys
- Major Block mountains
  - Rift valley in Africa
  - Narmada river Valley in India between the Vindhya and Satpura horsts.
  - Rhine valley in Europe
  - Vosges mountains in France
  - Black forest in Germany

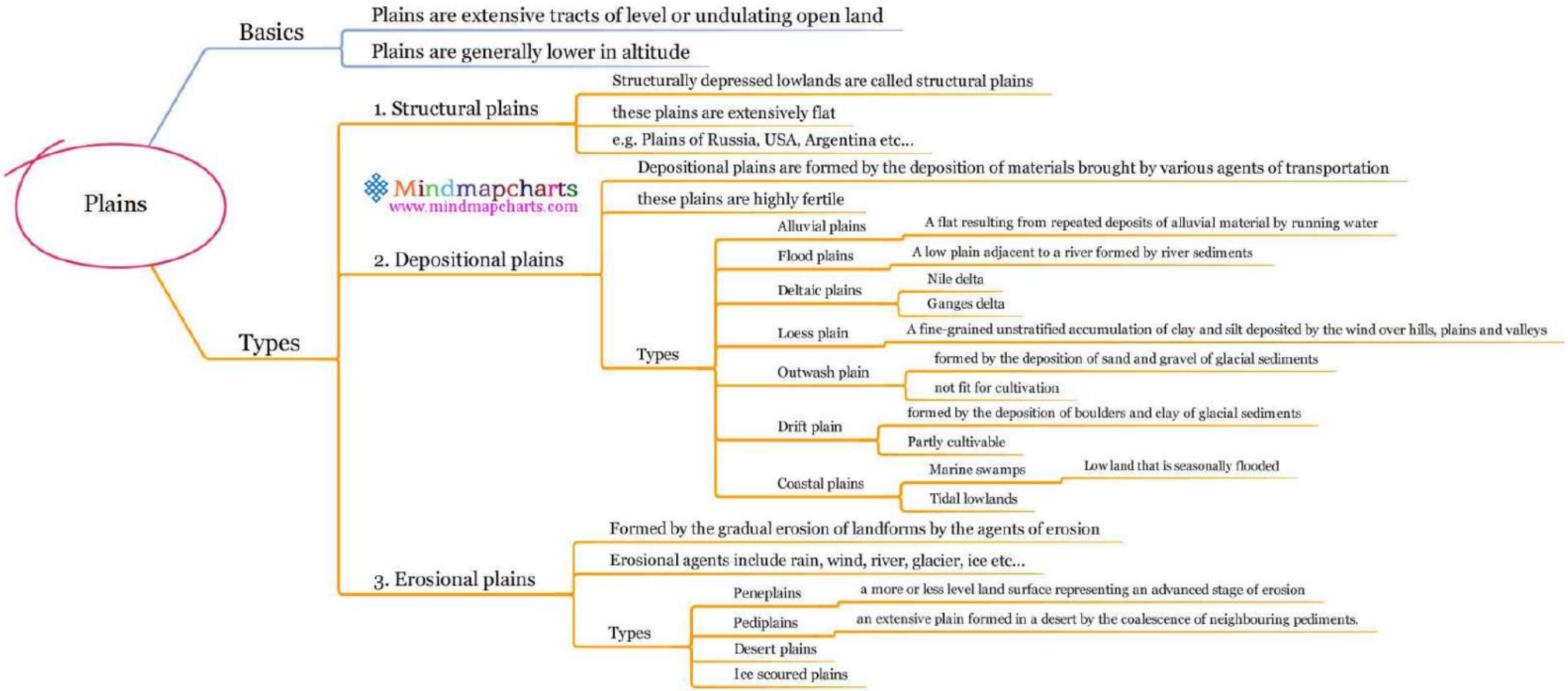
3) Volcanic mountains

- Formed when molten rock or lava erupts, and piles upon the surface
- Types
  - Shield Volcano
  - Strato volcano
  - Dome mountains
- Major Volcano mountains
  - Mount Fuji in Japan
  - Mount Pinatubo in the Philippines
  - Navajo Mountain in the United States
  - Mount Cotopaxi in Ecuador

4) Plateau or Erosion mountains

- Formed by denudation or weathering forces
- Large mountains are subjected to the agents of erosion (water, wind, ice, and gravity) which results in plateaus
- Major plateaus of erosion
  - Deccan plateau


Plateau
Basics
A relatively flat highland is called as plateau
Plateaus are also known as tablelands
Mindmapcharts
www.mindmapcharts.com
Types
1. Continental plateau
Also known as Tectonic or Intermontane plateau
Formed by the upliftment of earth due to plate tectonics
They are vast and have almost uniform altitude
Plateau enclosed by fold mountains are called intermont plateau
e.g. Tibetan plateau is enclosed by Himalayas and Kunlun mountains
2. Volcanic or lava plateau
lava flows in the form of successive layers of sheets and cools to form volcanic plateau
Important lava plateau
Deccan plateau
Columbian plateau
3. Border plateau
Formed along the borders of Mountain ranges
e.g. Piedmont plateau, Colorado plateau
4. Dissected or erosional plateau
Plateaus are worn down by the weathering processes to form the dissected plateau
e.g. Scottish islands


Plains
Basics
Plains are extensive tracts of level or undulating open land
Plains are generally lower in altitude
Types
1. Structural plains
Structurally depressed lowlands are called structural plains
these plains are extensively flat
e.g. Plains of Russia, USA, Argentina etc...
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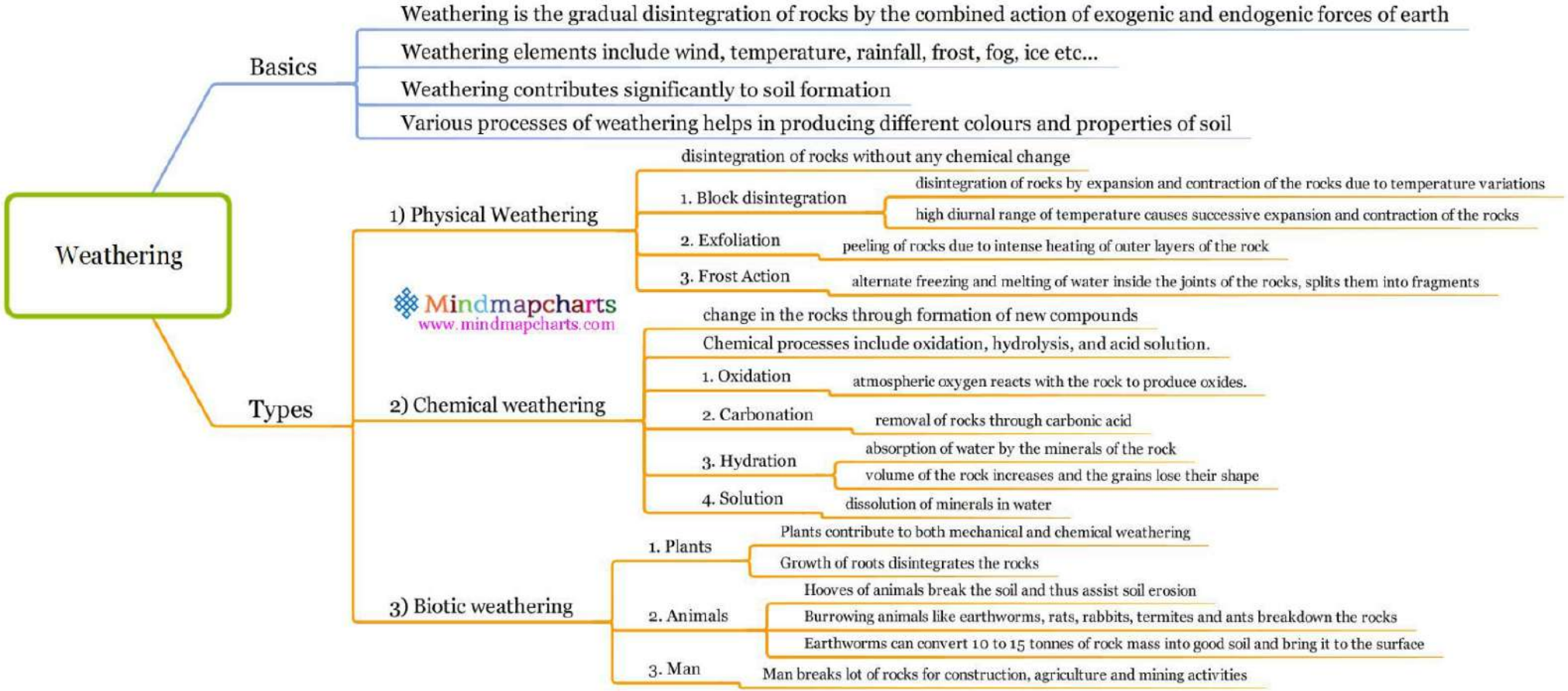
2. Depositional plains
Depositional plains are formed by the deposition of materials brought by various agents of transportation
these plains are highly fertile
Types
Alluvial plains
A flat resulting from repeated deposits of alluvial material by running water
Flood plains
A low plain adjacent to a river formed by river sediments
Deltaic plains
Nile delta
Ganges delta
Loess plain
A fine-grained unstratified accumulation of clay and silt deposited by the wind over hills, plains and valleys
Outwash plain
formed by the deposition of sand and gravel of glacial sediments
not fit for cultivation
Drift plain
formed by the deposition of boulders and clay of glacial sediments
Partly cultivable
Coastal plains
Marine swamps
Low land that is seasonally flooded
Tidal lowlands
3. Erosional plains
Formed by the gradual erosion of landforms by the agents of erosion
Erosional agents include rain, wind, river, glacier, ice etc...
Types
Peneplains
a more or less level land surface representing an advanced stage of erosion
Pediplains
an extensive plain formed in a desert by the coalescence of neighbouring pediments.
Desert plains
Ice scoured plains


Weathering
Basics
Weathering is the gradual disintegration of rocks by the combined action of exogenic and endogenic forces of earth
Weathering elements include wind, temperature, rainfall, frost, fog, ice etc...
Weathering contributes significantly to soil formation
Various processes of weathering helps in producing different colours and properties of soil
Types
1) Physical Weathering
disintegration of rocks without any chemical change
1. Block disintegration
disintegration of rocks by expansion and contraction of the rocks due to temperature variations
high diurnal range of temperature causes successive expansion and contraction of the rocks
2. Exfoliation
peeling of rocks due to intense heating of outer layers of the rock
3. Frost Action
alternate freezing and melting of water inside the joints of the rocks, splits them into fragments
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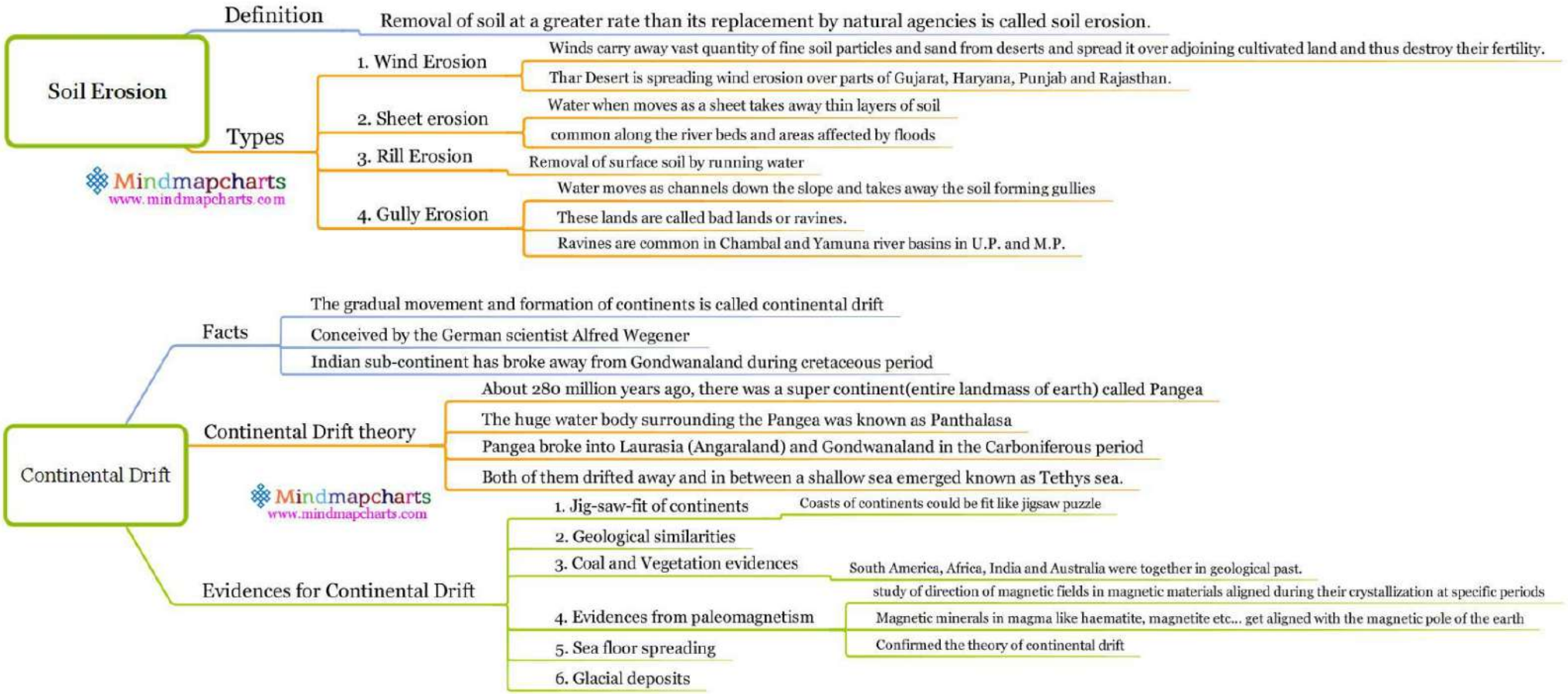
2) Chemical weathering
change in the rocks through formation of new compounds
Chemical processes include oxidation, hydrolysis, and acid solution.
1. Oxidation
atmospheric oxygen reacts with the rock to produce oxides.
2. Carbonation
removal of rocks through carbonic acid
3. Hydration
absorption of water by the minerals of the rock
volume of the rock increases and the grains lose their shape
4. Solution
dissolution of minerals in water
3) Biotic weathering
1. Plants
Plants contribute to both mechanical and chemical weathering
Growth of roots disintegrates the rocks
2. Animals
Hooves of animals break the soil and thus assist soil erosion
Burrowing animals like earthworms, rats, rabbits, termites and ants breakdown the rocks
Earthworms can convert 10 to 15 tonnes of rock mass into good soil and bring it to the surface
3. Man
Man breaks lot of rocks for construction, agriculture and mining activities


Soil Erosion
Definition
Removal of soil at a greater rate than its replacement by natural agencies is called soil erosion.
Types
1. Wind Erosion
Winds carry away vast quantity of fine soil particles and sand from deserts and spread it over adjoining cultivated land and thus destroy their fertility.
Thar Desert is spreading wind erosion over parts of Gujarat, Haryana, Punjab and Rajasthan.
2. Sheet erosion
Water when moves as a sheet takes away thin layers of soil
common along the river beds and areas affected by floods
3. Rill Erosion
Removal of surface soil by running water
4. Gully Erosion
Water moves as channels down the slope and takes away the soil forming gullies
These lands are called bad lands or ravines.
Ravines are common in Chambal and Yamuna river basins in U.P. and M.P.
Mindmapcharts
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Continental Drift
Facts
The gradual movement and formation of continents is called continental drift
Conceived by the German scientist Alfred Wegener
Indian sub-continent has broke away from Gondwanaland during cretaceous period
Continental Drift theory
About 280 million years ago, there was a super continent(entire landmass of earth) called Pangea
The huge water body surrounding the Pangea was known as Panthalasa
Pangea broke into Laurasia (Angaraland) and Gondwanaland in the Carboniferous period
Both of them drifted away and in between a shallow sea emerged known as Tethys sea.
Mindmapcharts
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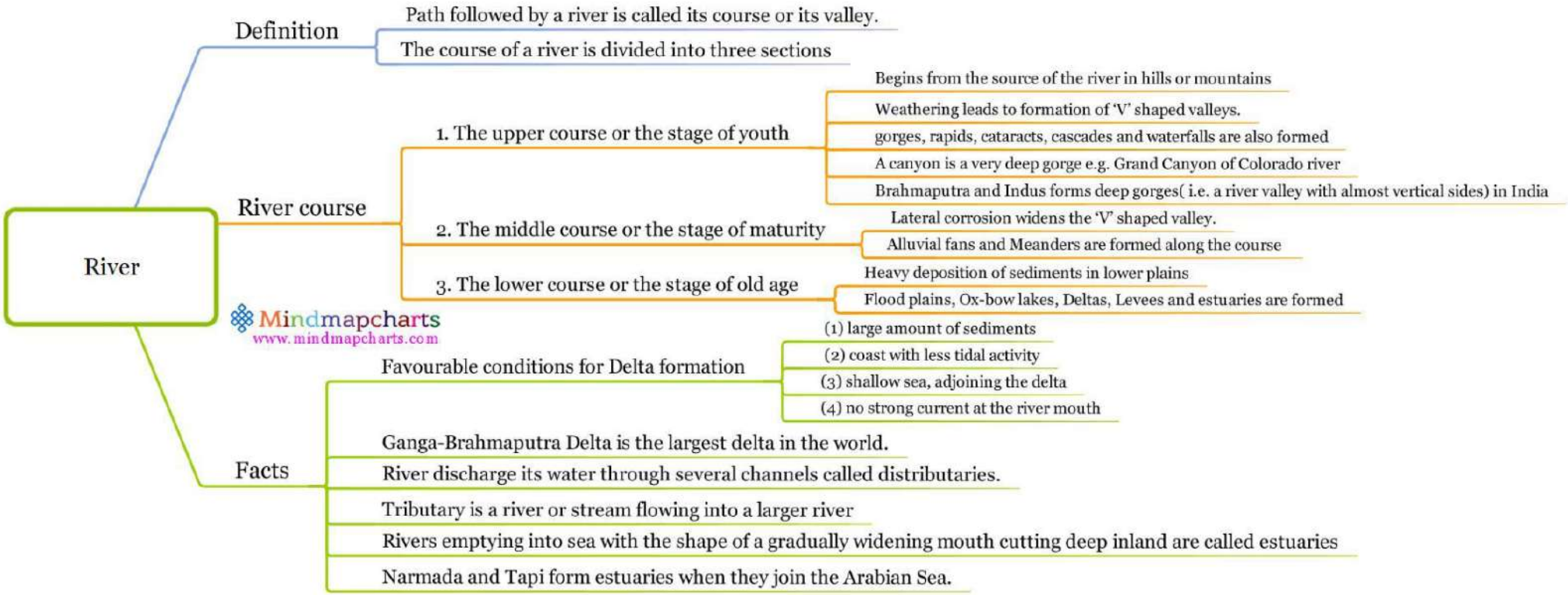
Evidences for Continental Drift
1. Jig-saw-fit of continents
Coasts of continents could be fit like jigsaw puzzle
2. Geological similarities
3. Coal and Vegetation evidences
South America, Africa, India and Australia were together in geological past.
4. Evidences from paleomagnetism
study of direction of magnetic fields in magnetic materials aligned during their crystallization at specific periods
Magnetic minerals in magma like haematite, magnetite etc... get aligned with the magnetic pole of the earth
Confirmed the theory of continental drift
5. Sea floor spreading
6. Glacial deposits


River
Definition
Path followed by a river is called its course or its valley.
The course of a river is divided into three sections
River course
1. The upper course or the stage of youth
Begins from the source of the river in hills or mountains
Weathering leads to formation of 'V' shaped valleys.
gorges, rapids, cataracts, cascades and waterfalls are also formed
A canyon is a very deep gorge e.g. Grand Canyon of Colorado river
Brahmaputra and Indus forms deep gorges(i.e. a river valley with almost vertical sides) in India
2. The middle course or the stage of maturity
Lateral corrosion widens the 'V' shaped valley.
Alluvial fans and Meanders are formed along the course
3. The lower course or the stage of old age
Heavy deposition of sediments in lower plains
Flood plains, Ox-bow lakes, Deltas, Levees and estuaries are formed
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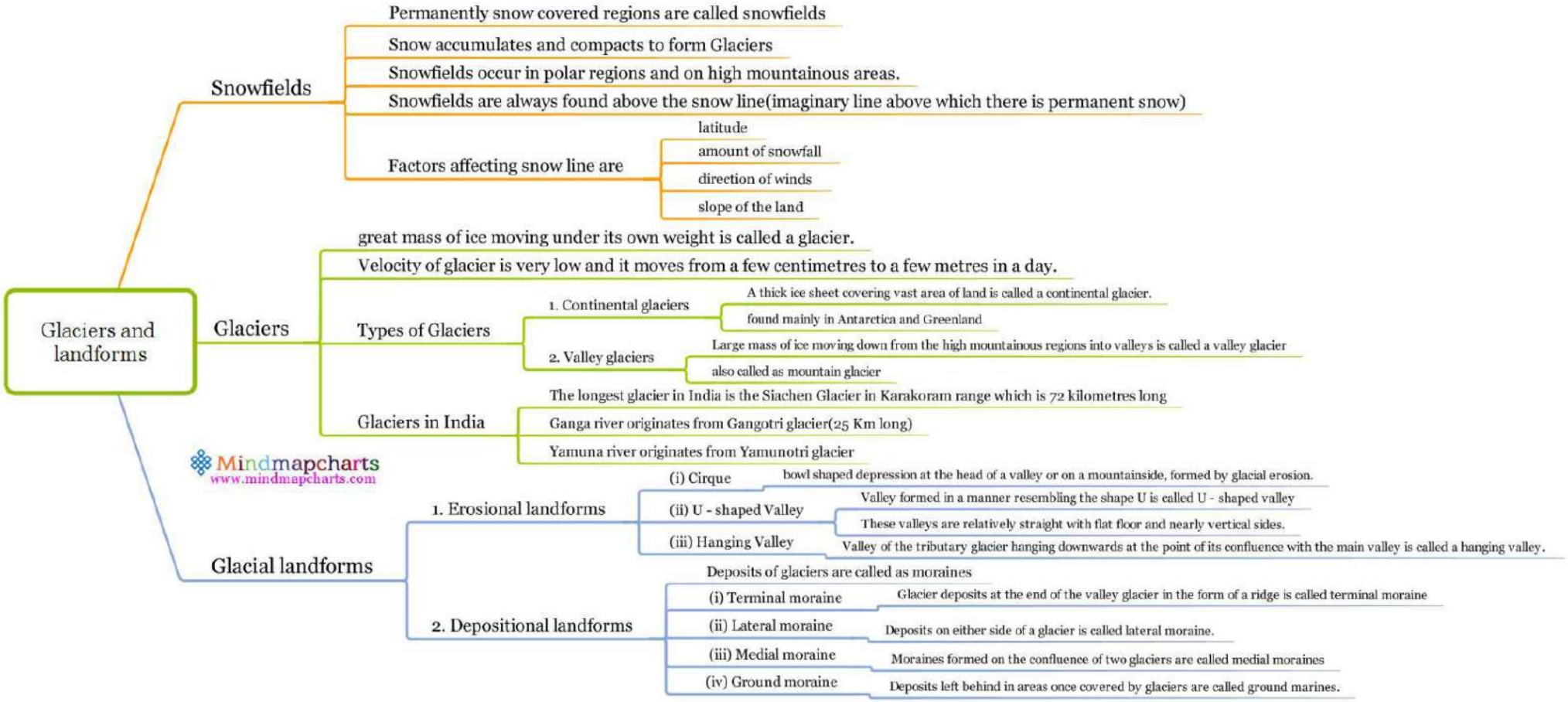
Facts
Favourable conditions for Delta formation
(1) large amount of sediments
(2) coast with less tidal activity
(3) shallow sea, adjoining the delta
(4) no strong current at the river mouth
Ganga-Brahmaputra Delta is the largest delta in the world.
River discharge its water through several channels called distributaries.
Tributary is a river or stream flowing into a larger river
Rivers emptying into sea with the shape of a gradually widening mouth cutting deep inland are called estuaries
Narmada and Tapi form estuaries when they join the Arabian Sea.


Glaciers and landforms
Snowfields
Permanently snow covered regions are called snowfields
Snow accumulates and compacts to form Glaciers
Snowfields occur in polar regions and on high mountainous areas.
Snowfields are always found above the snow line(imaginary line above which there is permanent snow)
Factors affecting snow line are
latitude
amount of snowfall
direction of winds
slope of the land
Glaciers
great mass of ice moving under its own weight is called a glacier.
Velocity of glacier is very low and it moves from a few centimetres to a few metres in a day.
Types of Glaciers
1. Continental glaciers
A thick ice sheet covering vast area of land is called a continental glacier.
found mainly in Antarctica and Greenland
2. Valley glaciers
Large mass of ice moving down from the high mountainous regions into valleys is called a valley glacier
also called as mountain glacier
Glaciers in India
The longest glacier in India is the Siachen Glacier in Karakoram range which is 72 kilometres long
Ganga river originates from Gangotri glacier(25 Km long)
Yamuna river originates from Yamunotri glacier
Mindmapcharts
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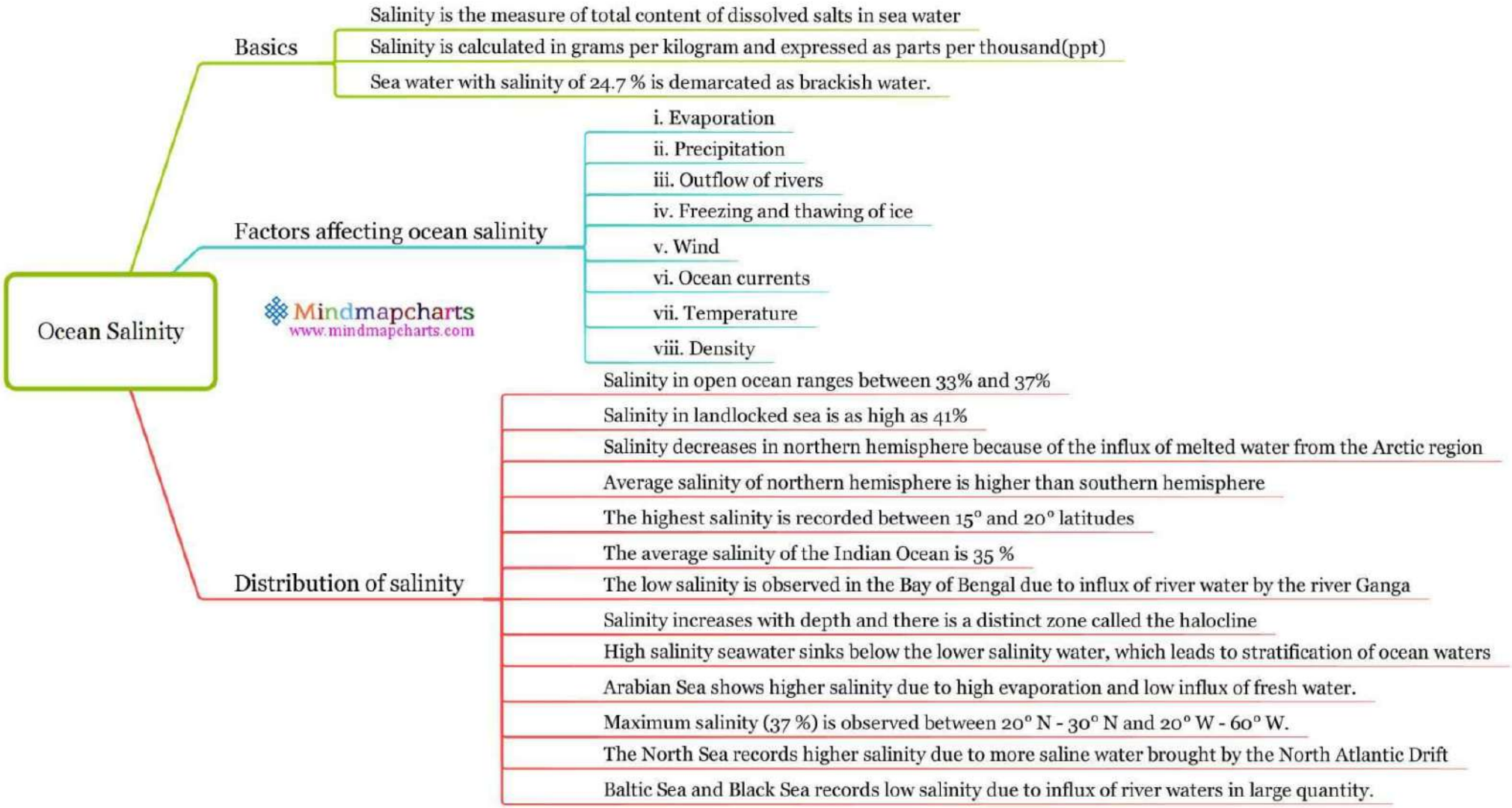
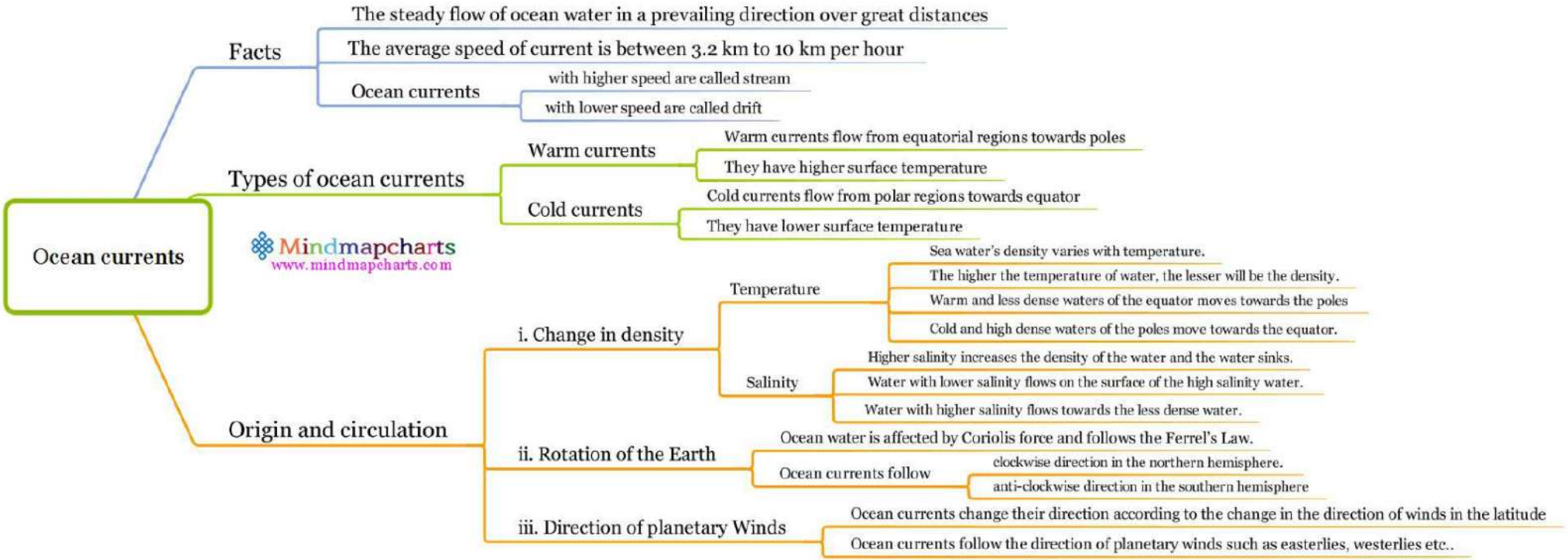
Glacial landforms
1. Erosional landforms
(i) Cirque
bowl shaped depression at the head of a valley or on a mountainside, formed by glacial erosion.
(ii) U - shaped Valley
Valley formed in a manner resembling the shape U is called U - shaped valley
These valleys are relatively straight with flat floor and nearly vertical sides.
(iii) Hanging Valley
Valley of the tributary glacier hanging downwards at the point of its confluence with the main valley is called a hanging valley.
2. Depositional landforms
Deposits of glaciers are called as moraines
(i) Terminal moraine
Glacier deposits at the end of the valley glacier in the form of a ridge is called terminal moraine
(ii) Lateral moraine
Deposits on either side of a glacier is called lateral moraine.
(iii) Medial moraine
Moraines formed on the confluence of two glaciers are called medial moraines
(iv) Ground moraine
Deposits left behind in areas once covered by glaciers are called ground marines.




Ocean currents
Facts
The steady flow of ocean water in a prevailing direction over great distances
The average speed of current is between 3.2 km to 10 km per hour
Ocean currents
with higher speed are called stream
with lower speed are called drift
Types of ocean currents
Warm currents
Warm currents flow from equatorial regions towards poles
They have higher surface temperature
Cold currents
Cold currents flow from polar regions towards equator
They have lower surface temperature
Mindmapcharts
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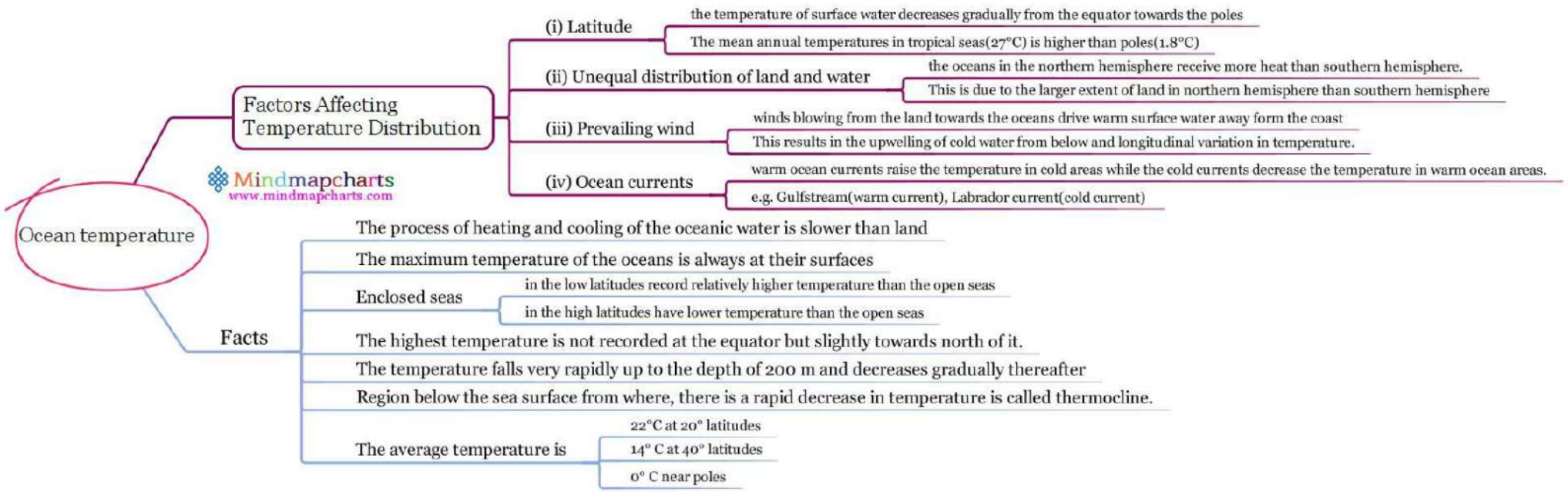
Origin and circulation
i. Change in density
Temperature
Sea water's density varies with temperature.
The higher the temperature of water, the lesser will be the density.
Warm and less dense waters of the equator moves towards the poles
Cold and high dense waters of the poles move towards the equator.
Salinity
Higher salinity increases the density of the water and the water sinks.
Water with lower salinity flows on the surface of the high salinity water.
Water with higher salinity flows towards the less dense water.
ii. Rotation of the Earth
Ocean water is affected by Coriolis force and follows the Ferrel's Law.
Ocean currents follow
clockwise direction in the northern hemisphere.
anti-clockwise direction in the southern hemisphere
iii. Direction of planetary Winds
Ocean currents change their direction according to the change in the direction of winds in the latitude
Ocean currents follow the direction of planetary winds such as easterlies, westerlies etc..


Ocean temperature
Factors Affecting Temperature Distribution
(i) Latitude
the temperature of surface water decreases gradually from the equator towards the poles
The mean annual temperatures in tropical seas(27°C) is higher than poles(1.8°C)
(ii) Unequal distribution of land and water
the oceans in the northern hemisphere receive more heat than southern hemisphere.
This is due to the larger extent of land in northern hemisphere than southern hemisphere
(iii) Prevailing wind
winds blowing from the land towards the oceans drive warm surface water away form the coast
This results in the upwelling of cold water from below and longitudinal variation in temperature.
(iv) Ocean currents
warm ocean currents raise the temperature in cold areas while the cold currents decrease the temperature in warm ocean areas.
e.g. Gulfstream(warm current), Labrador current(cold current)
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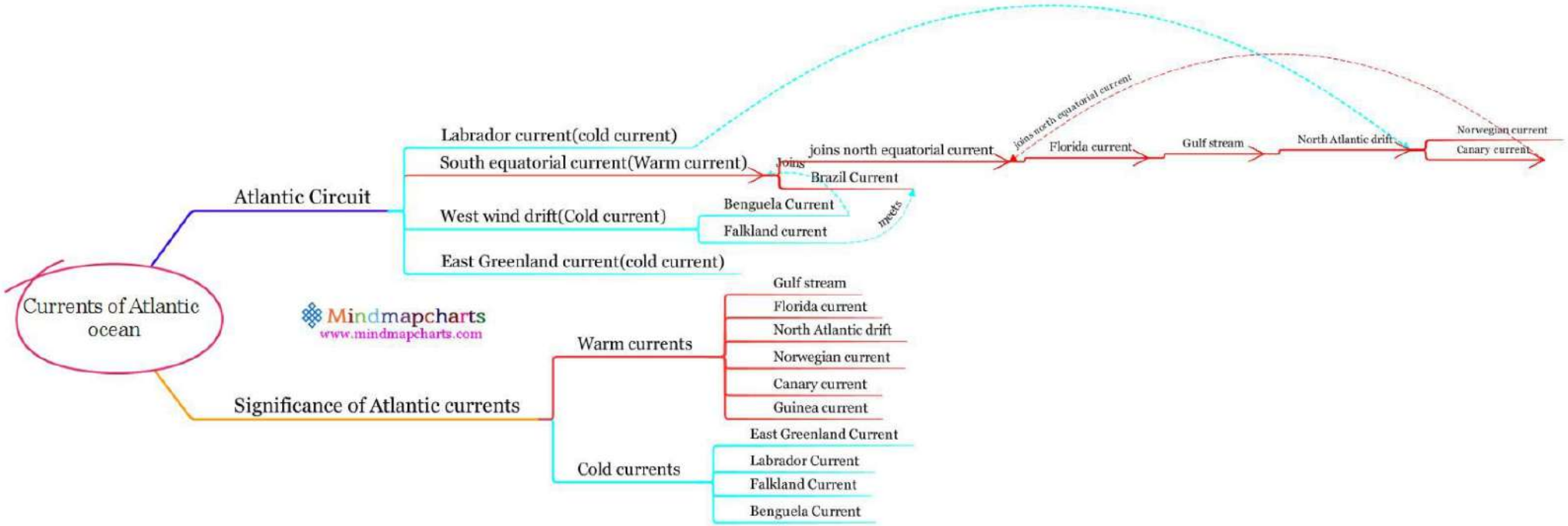
Facts
The process of heating and cooling of the oceanic water is slower than land
The maximum temperature of the oceans is always at their surfaces
Enclosed seas
in the low latitudes record relatively higher temperature than the open seas
in the high latitudes have lower temperature than the open seas
The highest temperature is not recorded at the equator but slightly towards north of it.
The temperature falls very rapidly up to the depth of 200 m and decreases gradually thereafter
Region below the sea surface from where, there is a rapid decrease in temperature is called thermocline.
The average temperature is
22°C at 20° latitudes
14° C at 40° latitudes
0° C near poles


Currents of Atlantic ocean
Atlantic Circuit
Labrador current(cold current)
South equatorial current(Warm current)
joins north equatorial current
Florida current
Gulf stream
North Atlantic drift
Norwegian current
Canary current
joins north equatorial current
joins
Brazil Current
meets
West wind drift(Cold current)
Benguela Current
Falkland current
East Greenland current(cold current)
Mindmapcharts
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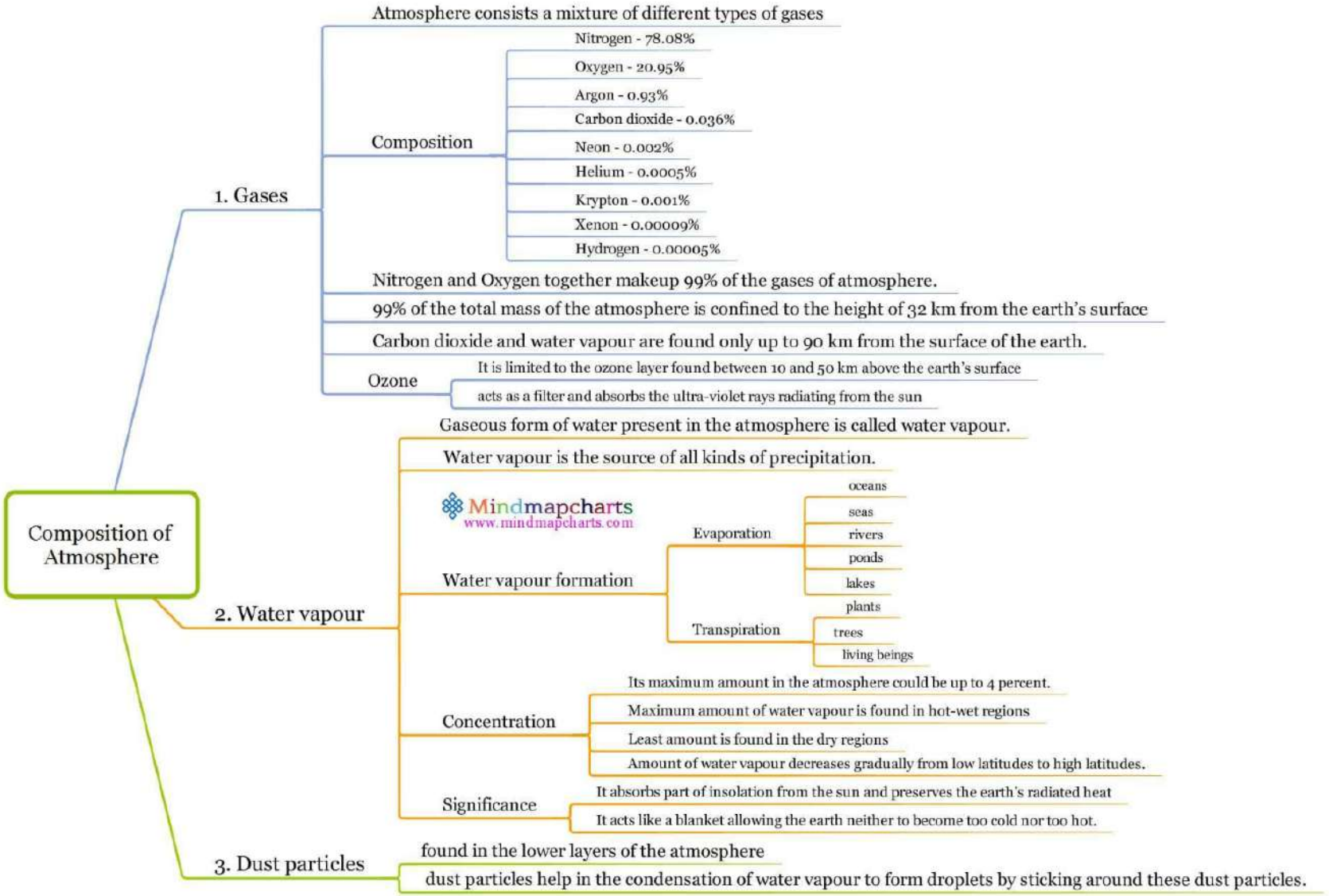
Significance of Atlantic currents
Warm currents
Gulf stream
Florida current
North Atlantic drift
Norwegian current
Canary current
Guinea current
Cold currents
East Greenland Current
Labrador Current
Falkland Current
Benguela Current


Composition of Atmosphere
1. Gases
Atmosphere consists a mixture of different types of gases
Composition
Nitrogen - 78.08%
Oxygen - 20.95%
Argon - 0.93%
Carbon dioxide - 0.036%
Neon - 0.002%
Helium - 0.0005%
Krypton - 0.001%
Xenon - 0.00009%
Hydrogen - 0.00005%
Nitrogen and Oxygen together makeup 99% of the gases of atmosphere.
99% of the total mass of the atmosphere is confined to the height of 32 km from the earth's surface
Carbon dioxide and water vapour are found only up to 90 km from the surface of the earth.
Ozone
It is limited to the ozone layer found between 10 and 50 km above the earth's surface
acts as a filter and absorbs the ultra-violet rays radiating from the sun
2. Water vapour
Gaseous form of water present in the atmosphere is called water vapour.
Water vapour is the source of all kinds of precipitation.
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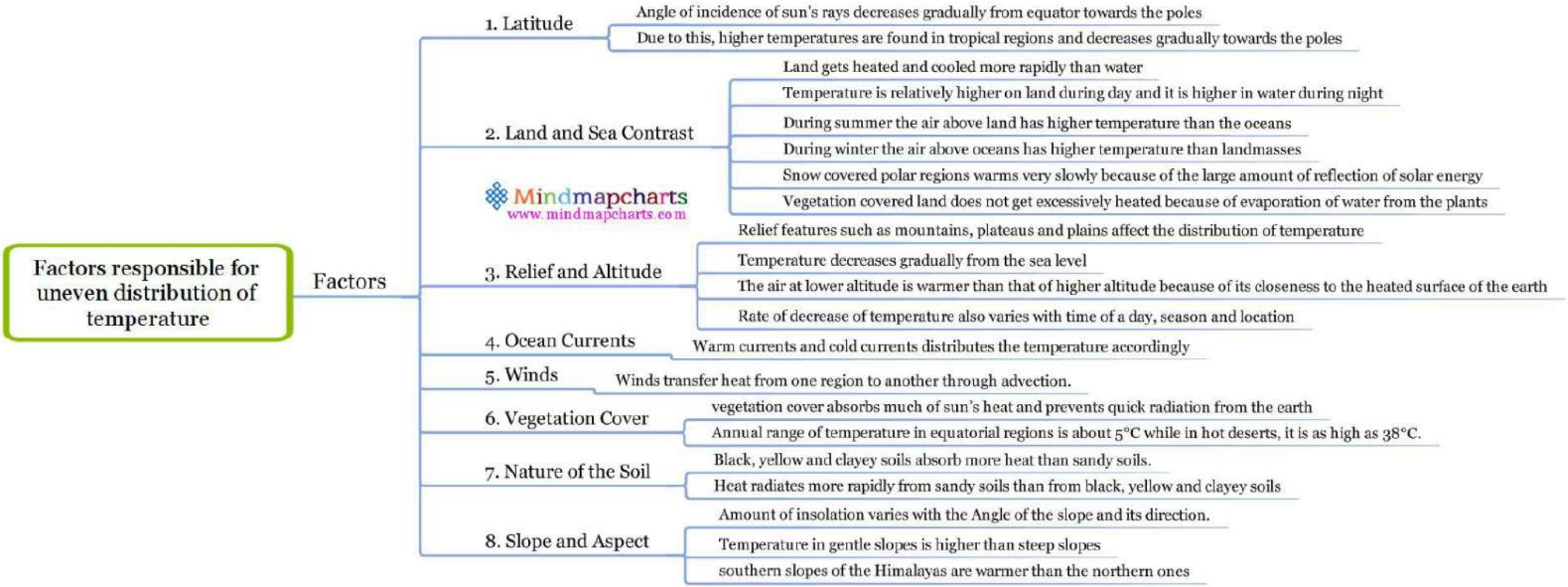
Water vapour formation
Evaporation
oceans
seas
rivers
ponds
lakes
Transpiration
plants
trees
living beings
Concentration
Its maximum amount in the atmosphere could be up to 4 percent.
Maximum amount of water vapour is found in hot-wet regions
Least amount is found in the dry regions
Amount of water vapour decreases gradually from low latitudes to high latitudes.
Significance
It absorbs part of insolation from the sun and preserves the earth's radiated heat
It acts like a blanket allowing the earth neither to become too cold nor too hot.
3. Dust particles
found in the lower layers of the atmosphere
dust particles help in the condensation of water vapour to form droplets by sticking around these dust particles.


Factors responsible for uneven distribution of temperature
Factors
1. Latitude
Angle of incidence of sun's rays decreases gradually from equator towards the poles
Due to this, higher temperatures are found in tropical regions and decreases gradually towards the poles
2. Land and Sea Contrast
Land gets heated and cooled more rapidly than water
Temperature is relatively higher on land during day and it is higher in water during night
During summer the air above land has higher temperature than the oceans
During winter the air above oceans has higher temperature than landmasses
Snow covered polar regions warms very slowly because of the large amount of reflection of solar energy
Vegetation covered land does not get excessively heated because of evaporation of water from the plants
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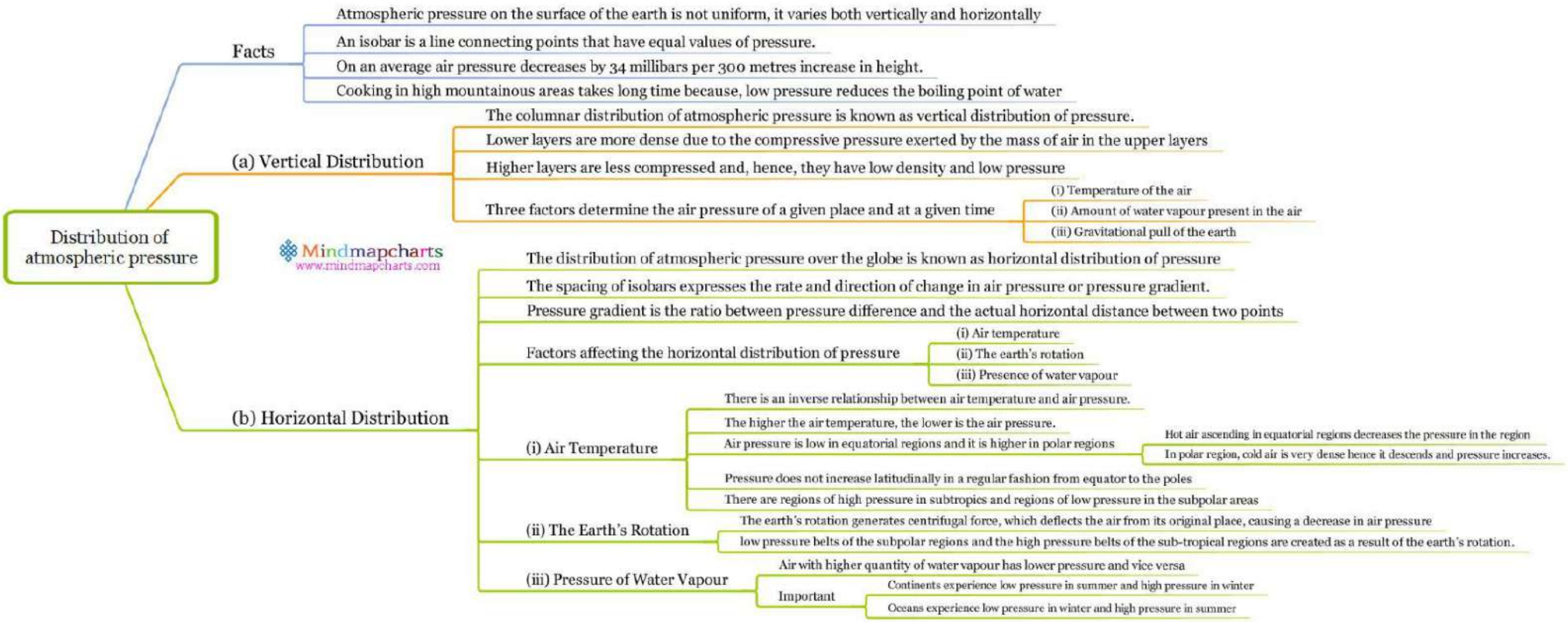
3. Relief and Altitude
Relief features such as mountains, plateaus and plains affect the distribution of temperature
Temperature decreases gradually from the sea level
The air at lower altitude is warmer than that of higher altitude because of its closeness to the heated surface of the earth
Rate of decrease of temperature also varies with time of a day, season and location
4. Ocean Currents
Warm currents and cold currents distributes the temperature accordingly
5. Winds
Winds transfer heat from one region to another through advection.
6. Vegetation Cover
vegetation cover absorbs much of sun's heat and prevents quick radiation from the earth
Annual range of temperature in equatorial regions is about 5°C while in hot deserts, it is as high as 38°C.
7. Nature of the Soil
Black, yellow and clayey soils absorb more heat than sandy soils.
Heat radiates more rapidly from sandy soils than from black, yellow and clayey soils
8. Slope and Aspect
Amount of insolation varies with the Angle of the slope and its direction.
Temperature in gentle slopes is higher than steep slopes
southern slopes of the Himalayas are warmer than the northern ones


Distribution of atmospheric pressure
Facts
Atmospheric pressure on the surface of the earth is not uniform, it varies both vertically and horizontally
An isobar is a line connecting points that have equal values of pressure.
On an average air pressure decreases by 34 millibars per 300 metres increase in height.
Cooking in high mountainous areas takes long time because, low pressure reduces the boiling point of water
(a) Vertical Distribution
The columnar distribution of atmospheric pressure is known as vertical distribution of pressure.
Lower layers are more dense due to the compressive pressure exerted by the mass of air in the upper layers
Higher layers are less compressed and, hence, they have low density and low pressure
Three factors determine the air pressure of a given place and at a given time
(i) Temperature of the air
(ii) Amount of water vapour present in the air
(iii) Gravitational pull of the earth
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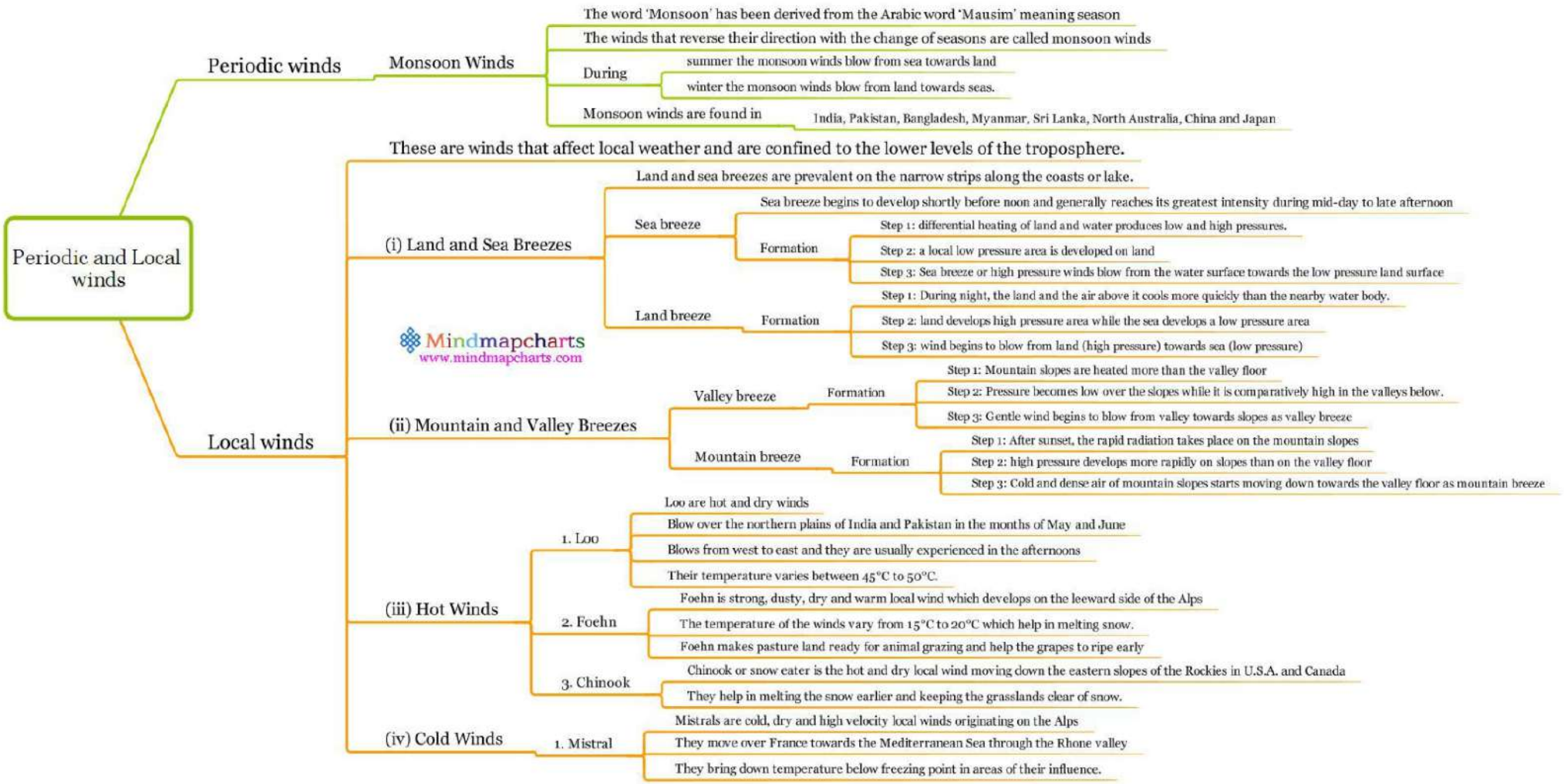
(b) Horizontal Distribution
The distribution of atmospheric pressure over the globe is known as horizontal distribution of pressure
The spacing of isobars expresses the rate and direction of change in air pressure or pressure gradient.
Pressure gradient is the ratio between pressure difference and the actual horizontal distance between two points
Factors affecting the horizontal distribution of pressure
(i) Air temperature
(ii) The earth's rotation
(iii) Presence of water vapour
(i) Air Temperature
There is an inverse relationship between air temperature and air pressure.
The higher the air temperature, the lower is the air pressure.
Air pressure is low in equatorial regions and it is higher in polar regions
Hot air ascending in equatorial regions decreases the pressure in the region
In polar region, cold air is very dense hence it descends and pressure increases.
Pressure does not increase latitudinally in a regular fashion from equator to the poles
There are regions of high pressure in subtropics and regions of low pressure in the subpolar areas
(ii) The Earth's Rotation
The earth's rotation generates centrifugal force, which deflects the air from its original place, causing a decrease in air pressure
low pressure belts of the subpolar regions and the high pressure belts of the sub-tropical regions are created as a result of the earth's rotation.
(iii) Pressure of Water Vapour
Air with higher quantity of water vapour has lower pressure and vice versa
Important
Continents experience low pressure in summer and high pressure in winter
Oceans experience low pressure in winter and high pressure in summer


Periodic and Local winds
Periodic winds
Monsoon Winds
The word 'Monsoon' has been derived from the Arabic word 'Mausim' meaning season
The winds that reverse their direction with the change of seasons are called monsoon winds
During
summer the monsoon winds blow from sea towards land
winter the monsoon winds blow from land towards seas.
Monsoon winds are found in
India, Pakistan, Bangladesh, Myanmar, Sri Lanka, North Australia, China and Japan
Local winds
These are winds that affect local weather and are confined to the lower levels of the troposphere.
(i) Land and Sea Breezes
Land and sea breezes are prevalent on the narrow strips along the coasts or lake.
Sea breeze
Sea breeze begins to develop shortly before noon and generally reaches its greatest intensity during mid-day to late afternoon
Formation
Step 1: differential heating of land and water produces low and high pressures.
Step 2: a local low pressure area is developed on land
Step 3: Sea breeze or high pressure winds blow from the water surface towards the low pressure land surface
Land breeze
Formation
Step 1: During night, the land and the air above it cools more quickly than the nearby water body.
Step 2: land develops high pressure area while the sea develops a low pressure area
Step 3: wind begins to blow from land (high pressure) towards sea (low pressure)
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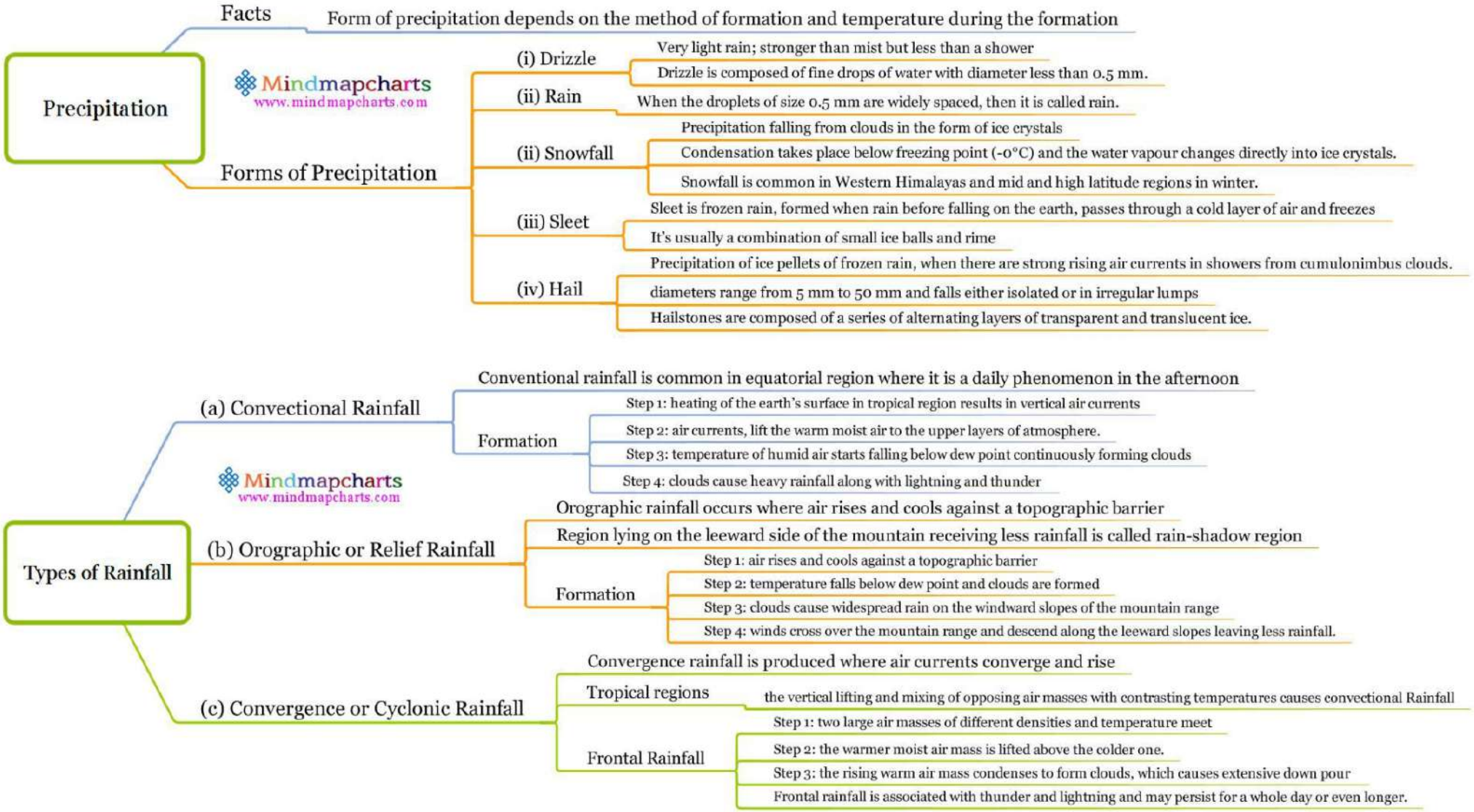
(ii) Mountain and Valley Breezes
Valley breeze
Formation
Step 1: Mountain slopes are heated more than the valley floor
Step 2: Pressure becomes low over the slopes while it is comparatively high in the valleys below.
Step 3: Gentle wind begins to blow from valley towards slopes as valley breeze
Mountain breeze
Formation
Step 1: After sunset, the rapid radiation takes place on the mountain slopes
Step 2: high pressure develops more rapidly on slopes than on the valley floor
Step 3: Cold and dense air of mountain slopes starts moving down towards the valley floor as mountain breeze
(iii) Hot Winds
1. Loo
Loo are hot and dry winds
Blow over the northern plains of India and Pakistan in the months of May and June
Blows from west to east and they are usually experienced in the afternoons
Their temperature varies between 45°C to 50°C.
2. Foehn
Foehn is strong, dusty, dry and warm local wind which develops on the leeward side of the Alps
The temperature of the winds vary from 15°C to 20°C which help in melting snow.
Foehn makes pasture land ready for animal grazing and help the grapes to ripe early
3. Chinook
Chinook or snow eater is the hot and dry local wind moving down the eastern slopes of the Rockies in U.S.A. and Canada
They help in melting the snow earlier and keeping the grasslands clear of snow.
(iv) Cold Winds
1. Mistral
Mistrals are cold, dry and high velocity local winds originating on the Alps
They move over France towards the Mediterranean Sea through the Rhone valley
They bring down temperature below freezing point in areas of their influence.


Precipitation
Facts
Form of precipitation depends on the method of formation and temperature during the formation
Forms of Precipitation
(i) Drizzle
Very light rain; stronger than mist but less than a shower
Drizzle is composed of fine drops of water with diameter less than 0.5 mm.
(ii) Rain
When the droplets of size 0.5 mm are widely spaced, then it is called rain.
(ii) Snowfall
Precipitation falling from clouds in the form of ice crystals
Condensation takes place below freezing point (-0°C) and the water vapour changes directly into ice crystals.
Snowfall is common in Western Himalayas and mid and high latitude regions in winter.
(iii) Sleet
Sleet is frozen rain, formed when rain before falling on the earth, passes through a cold layer of air and freezes
It's usually a combination of small ice balls and rime
(iv) Hail
Precipitation of ice pellets of frozen rain, when there are strong rising air currents in showers from cumulonimbus clouds.
diameters range from 5 mm to 50 mm and falls either isolated or in irregular lumps
Hailstones are composed of a series of alternating layers of transparent and translucent ice.
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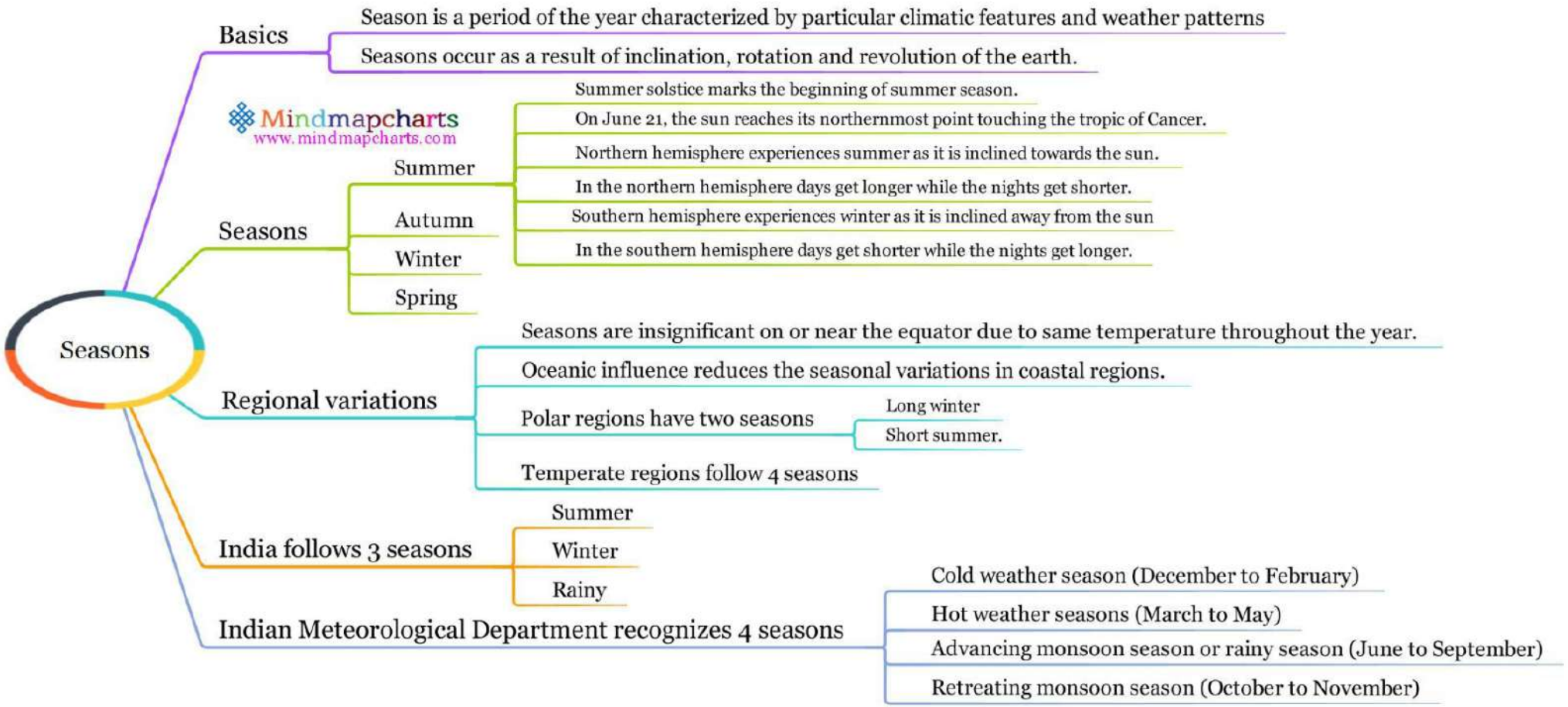
Types of Rainfall
(a) Convectional Rainfall
Conventional rainfall is common in equatorial region where it is a daily phenomenon in the afternoon
Formation
Step 1: heating of the earth's surface in tropical region results in vertical air currents
Step 2: air currents, lift the warm moist air to the upper layers of atmosphere.
Step 3: temperature of humid air starts falling below dew point continuously forming clouds
Step 4: clouds cause heavy rainfall along with lightning and thunder
(b) Orographic or Relief Rainfall
Orographic rainfall occurs where air rises and cools against a topographic barrier
Region lying on the leeward side of the mountain receiving less rainfall is called rain-shadow region
Formation
Step 1: air rises and cools against a topographic barrier
Step 2: temperature falls below dew point and clouds are formed
Step 3: clouds cause widespread rain on the windward slopes of the mountain range
Step 4: winds cross over the mountain range and descend along the leeward slopes leaving less rainfall.
(c) Convergence or Cyclonic Rainfall
Convergence rainfall is produced where air currents converge and rise
Tropical regions
the vertical lifting and mixing of opposing air masses with contrasting temperatures causes convectional Rainfall
Frontal Rainfall
Step 1: two large air masses of different densities and temperature meet
Step 2: the warmer moist air mass is lifted above the colder one.
Step 3: the rising warm air mass condenses to form clouds, which causes extensive down pour
Frontal rainfall is associated with thunder and lightning and may persist for a whole day or even longer.


Seasons
Basics
Season is a period of the year characterized by particular climatic features and weather patterns
Seasons occur as a result of inclination, rotation and revolution of the earth.
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Seasons
Summer
Summer solstice marks the beginning of summer season.
On June 21, the sun reaches its northernmost point touching the tropic of Cancer.
Northern hemisphere experiences summer as it is inclined towards the sun.
In the northern hemisphere days get longer while the nights get shorter.
Autumn
Southern hemisphere experiences winter as it is inclined away from the sun
Winter
In the southern hemisphere days get shorter while the nights get longer.
Spring
Regional variations
Seasons are insignificant on or near the equator due to same temperature throughout the year.
Oceanic influence reduces the seasonal variations in coastal regions.
Polar regions have two seasons
Long winter
Short summer.
Temperate regions follow 4 seasons
India follows 3 seasons
Summer
Winter
Rainy
Indian Meteorological Department recognizes 4 seasons
Cold weather season (December to February)
Hot weather seasons (March to May)
Advancing monsoon season or rainy season (June to September)
Retreating monsoon season (October to November)