

**GS Advanced Program 2023****Generic Booklet**Test Name/Code/No. : **37 (Batch-2)**

Name			
Email ID.			
Roll No.			
Mobile No.		Date	19/11/23

Allotted Time : 60 Minutes**Instructions to Candidates -**

- There are 7 Questions in this Question paper.
- All Questions are Compulsory.
- For all updates, please visit the noticeboard -
<https://noticeboard.forumias.com/gsap-2023/>

Important -

- Answers must be attempted in the QCA Booklet only.
- To upload the Answer Copies please visit to "My Course" section on -
<https://academy.forumias.com/>
- Only those copies will be evaluated which will be submitted before the next class.

Q. No.	Grade/Score
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Overall Grade/Score	

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Q.1)

Tropical cyclones refer to Secondary circulation of Global atmospheric circulation that distribute heat within the regions (Tropics) further, they are fast moving system of cumulonimbus clouds that originate over ocean and cause devastating impact on landfall.

Confinement largely to South China Sea, Bay of Bengal & Gulf of Mexico

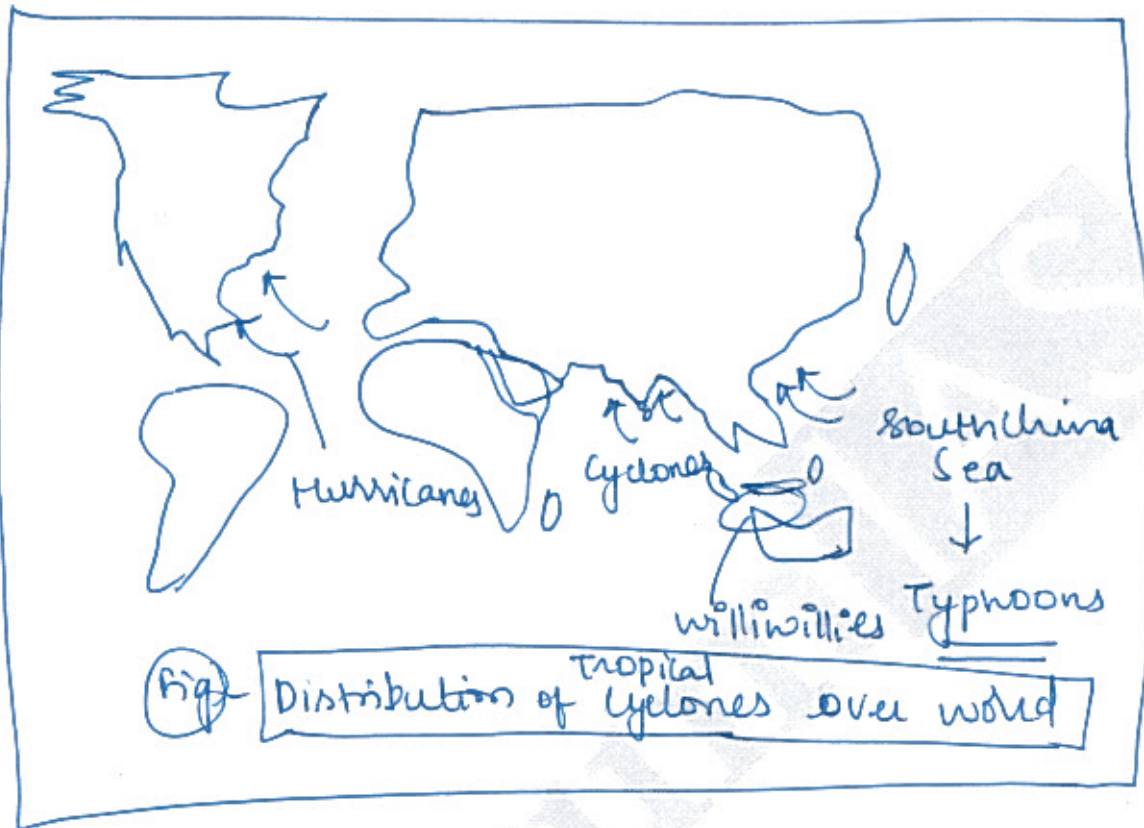
① Conducive conditions

- a) Continuous supply of warm & moist air
- b) sea surface temperature $\geq 27^{\circ}\text{C}$
- c) presence of Coriolis force
- d) low wind shear
- e) pre-existing low pressure systems.

② ~~Not~~ very rare in South Atlantic

due to — a) low sea surface temperature not enough for system

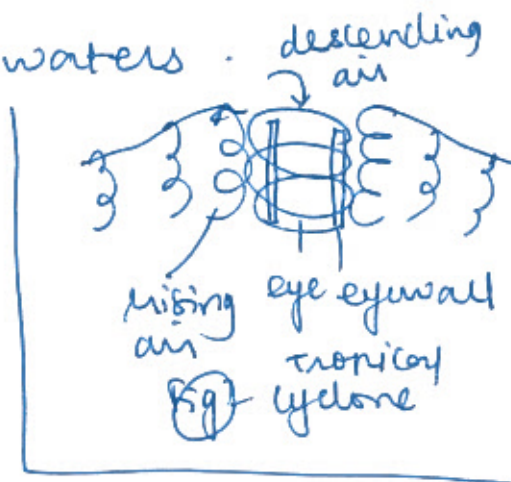
b) presence of windshear



③ Movement from ~~to~~ East to west

④ Feature of western waters . descending air

Today, Nomenclature and early warning system - color coded helps to mitigate the impact of Tropical cyclones.



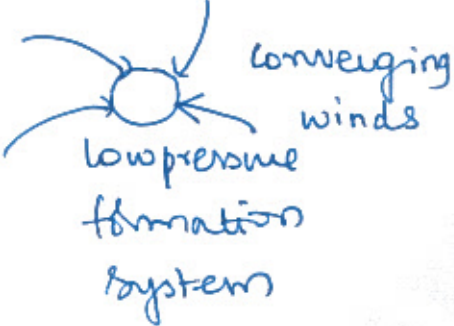
Overall Grading (✓)

Poor			Average			Good		
1	2	3	4	5	6	7	8	9

2.2)

Tropical and temperate cyclones are secondary circulation system aiding heat distribution within Tropics and Temperate respectively.

Differences

Tropical	Temperate
① <u>Basic Ingredients</u>  converging winds low pressure formation system - Sea surface temperature $> 27^{\circ}\text{C}$ - occurs in Tropics $5-15^{\circ}$ latitudes	Formation of <u>fronts</u> causing <u>frontogenesis</u> due to confrontation of two different <u>air masses</u>
② <u>Difference in stages</u> <u>Stage-1 Incipient stage</u> - low pressure - converging air - Rising air mass	<u>stage-1</u> : primary stage air masses with different characteristics flow <u>parallel</u> to each other

Tropical



Stage-2 mature stage

creation of cumulonimbus clouds due to intensification of low pressure system by latent heat of condensation fuelling it.

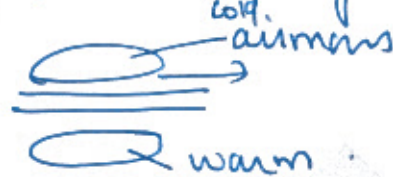
Stage-3 senile stage
landfall - leads to dissipation of cyclone

Other differences

East to West

Temperate

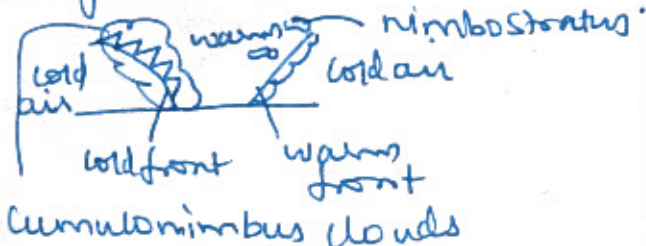
leading to Stationary front



Stage 2 Incipient stage

due to baroclinic conditions
low pressure is created
and two air masses
confront each other.

Stage-3 mature state



Stage-4

warm
cold upliftment
of warm air
mass

occluded front

West to East

Early warning system with cold codings help in mitigating the impact due to intensification of cyclones.

Overall Grading (✓)

Poor			Average			Good		
1	2	3	4	5	6	7	8	9

2.3)

Bombogenesis refers to formation of bomb cyclone due to rapid decrease of pressure of 24 millibars in a duration of 24 hours.

Features (1) It is a type of cyclone that develops majdly in North mid latitude regions

(2) Confrontation of two different air masses

(eg) maritime Tropical x continental polar
(MT) (CP)

(3) Intensification occur due to seeping of cold polar vortex cold air mass in to air mass intensifying the formation.



Difference of bomb cyclone from Temperate cyclone —

Bomb cyclone	Temperate cyclone
① Frequency of occurrence is comparatively less	Temperate cyclones occur throughout the year.
② Rapid decrease of pressure without gradually confronting	④ <u>Four stages</u> of formation leading to gradual development of Temperate cyclone
③ Cause great devastation to human lives, property	① Stationary front
④ Less area of impact	② Incipient stage
	③ mature stage (formation of clouds)
	④ occluded front
	comparatively less devastation
	covers more area.
	Today, due to climate change, we see increase in

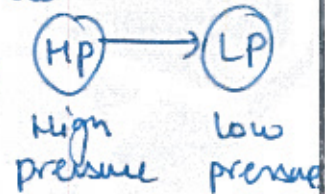
Overall Grading (✓) Intensity & frequency of Bomb cyclones.

Poor			Average			Good		
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2.4)

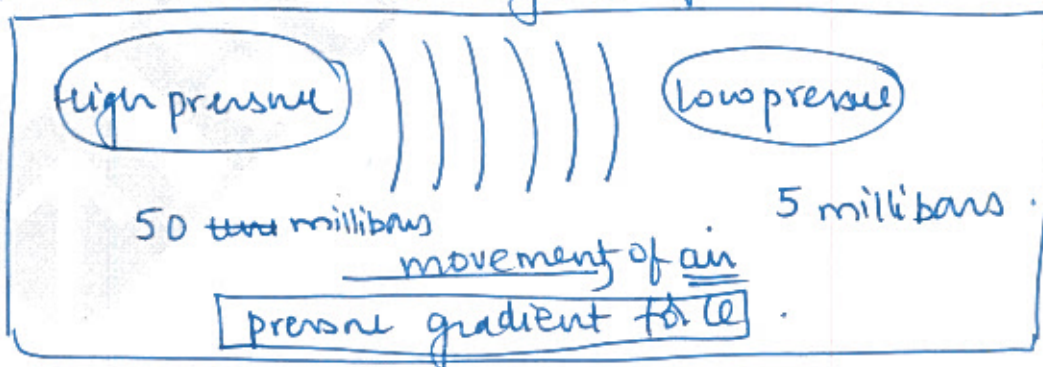
Air movements occurs when wind blows from high pressure to low pressure and aid in distribution of heat across earth in the form of planetary winds and local winds.

forces governing air movement



① pressure gradient force (PGF)

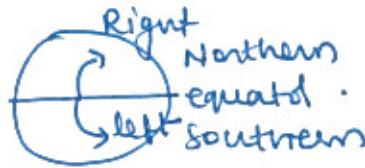
- a) strong PGF implies isobars are located close to each other
- b) warm air expands and has low pressure
- c) cold air has high pressure.



② Coriolis force

- a) NOT a real force but it's an effect due to rotation of earth on its axis from west to east

- b) deflect air to right in Northern hemisphere and to left in Southern hemisphere.



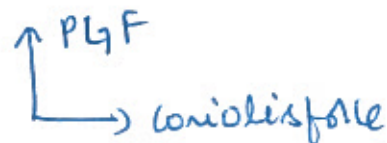
- c) zero at ~~poles~~ equator and maximum at pole
d) more speed of wind $\Rightarrow$ more deflection.

③ Frictional force

- 1) extends upto 1-3km from surface of earth

④ Gravitational force - acting downwards

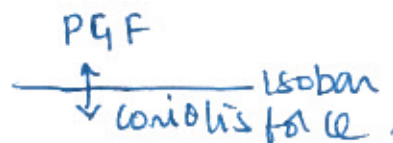
Surface winds / air movement



Geostrophic wind - NO frictional force present
(winds at from 500-1000m)

Northern hemisphere

$\rightarrow$ winds flow parallel to isobar



Thus, different forces aid in movement of air and helps in creation of global atmospheric circulation.

Overall Grading (✓)

Poor			Average			Good		
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2.5)

Dew point refers to Temperature of an air mass/water vapour at which saturation takes place

Features

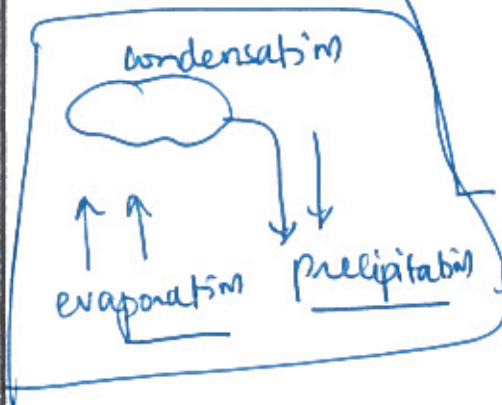
- ① Humidity { absolute humidity is amount of water vapour present in a parcel of air
Relative humidity - percentage of water vapour present to its capacity that air parcel can hold.

- ② changes in Saturation ~~dew point~~ can occur in 2 two ways

- a) when the absolute humidity of air parcel is raised to meet the saturation
 - b) when air parcel is raised above its temperature decreases leading to saturation
- absolute humidity = capacity

③ when an air parcel reaches dew point condensation takes place as it does not have the ability to hold any more water vapour.

④ condensation varies — If dew point $>$ freezing point then condensation occurs in form of Rain fall



— If dew point $<$ freezing point then condensation occurs in form of Snow fall

Forms of condensation → condensation refers to change of water vapour to rainfall/water/snow

* Dew

- 1) when air parcel have enough moisture and conditions — clear sky calm air long & long night are met
formation of dew takes place on cold surfaces
- 2) does not need Hygroscopic nuclei

⑧ Rainfall - when clouds aren't able to withhold any more water vapour, condensation occurs in form of water

⑨ Fog - formation of fog takes place closer to ground surface rapid condensation occurring within the atmosphere.

⑩ Mist - presence of more water vapour than fog
No visibility

⑪ Snowfall - when dew point $\leq$ freezing point
further, refrozen melted snow water occurs
when layer of air which has temperature $<$ freezing point overlies another layer of air closer to ground surface.

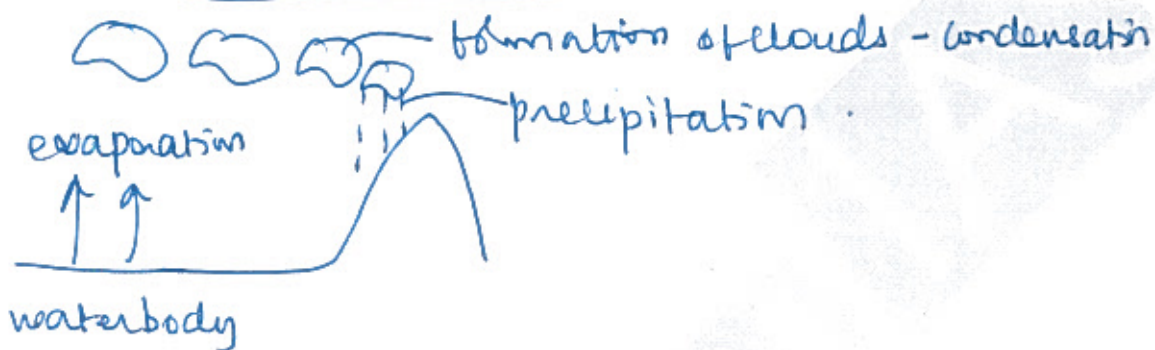
⑫ Hailstorm - concentric circles formation with water vapour
condensation completes the cycle of water essential for living beings.

Overall Grading (✓)

Poor			Average			Good		
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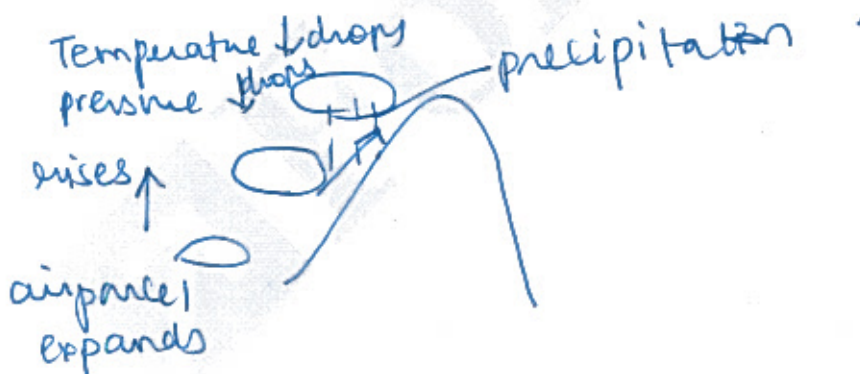
Q.6)

precipitation refers to phenomenon of transforming ~~to~~ condensed water vapour $\rightarrow$ tiny droplets (clouds) to water coming over surface of earth.



(Fig) - water cycle

Process of precipitation



on expansion of air parcel $\Rightarrow$ adiabatic

- ① cooling takes place.
- ② AS air parcel rises, temperature drops & pressure drops

- ③ Air parcel which is moisture laden is forced to shed water $\Rightarrow$ precipitation takes place.

Types of precipitation

- ① Rainfall - when dewpoint $>$ freezing point (0°C)
- ② Snowfall - when dewpoint $<$ freezing point (0°C)
- ③ Sleet - Refrozen melted snow water when air layer with temperature $<$ less than freezing point overlies air layer closer to ground surface.
- ④ Hailstorm - water vapour is condensed in the form of concentric layers of circles and precipitation occurs in the form of hail stones.

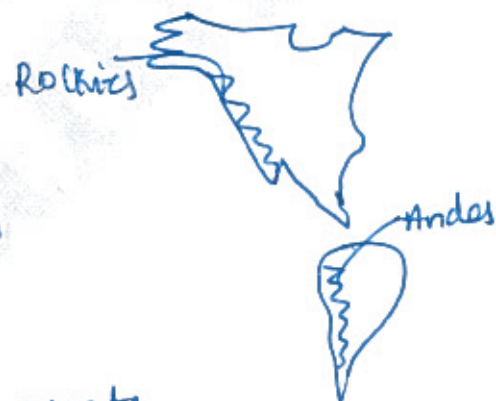
Distribution of precipitation on surface of earth

- ① at ^{ITCZ} Tropics - Intense heating of surface caused by insolation. warms up air parcel and formation of convectinal clouds, leading to convective rainfall

- ② At mountainous regions

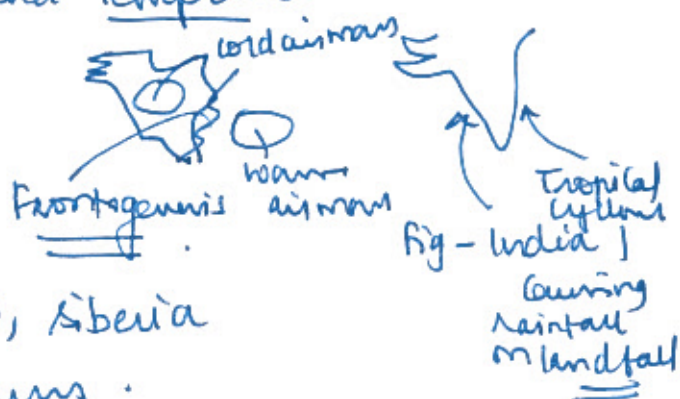
orographic rainfall

occurs due to windward side of Rockies, Andes mountains



- ③ Due to Tropical and Temperate cyclones

Cyclonic rainfall



- ④ over polar region, Siberia
↳ snowfall occurs.

Thus, Precipitation allows water circulation in atmosphere for sustaining biosphere.

Overall Grading (✓)

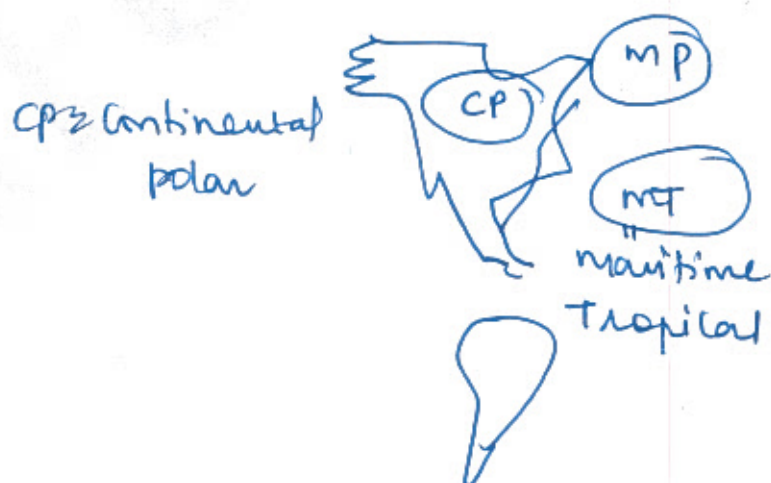
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2.7)

Air masses refer to large standing parcel of air whose vertical variation of humidity and Temperature is less and is distributed over large area & with less horizontal variation as well

Origin

- ① due to long period of time - staying over a region - Acquires characteristics of an area
- (eg) maritime Tropical area - warm and moist air mass



② - air mass prevalence

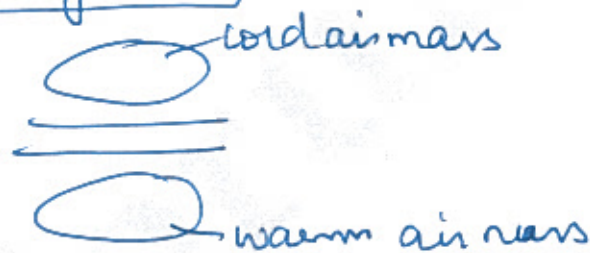
Role in influencing climatic patterns

- ① formation of frontogenesis through front formation in Temperate/mid latitudes
- ② Temperate cyclones

Stage-1 → primary stage

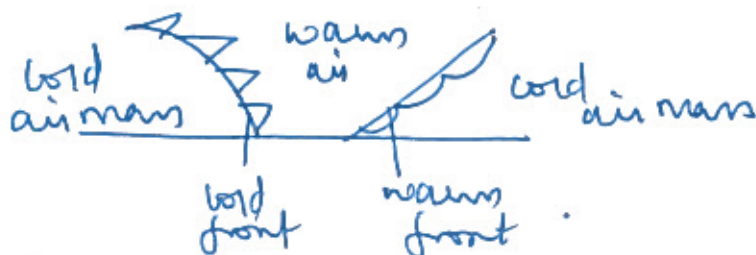
two different air masses move parallel to each other forming a

stationary front

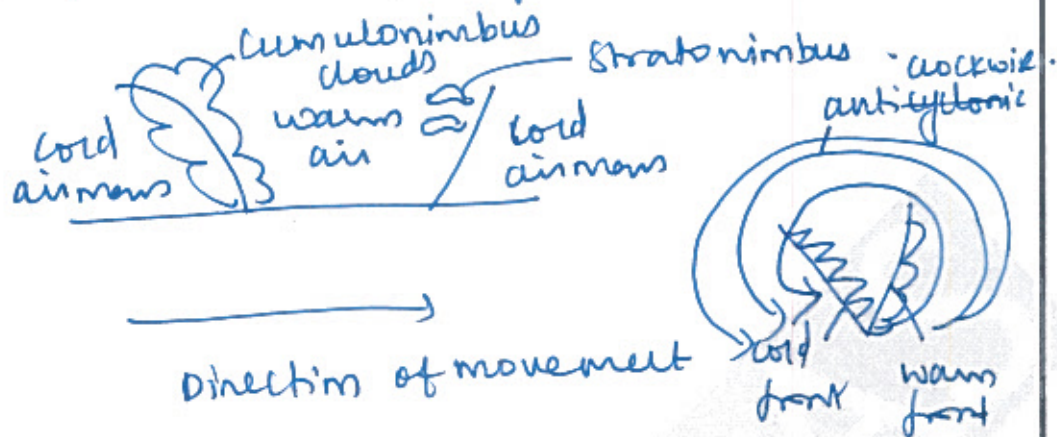


Stage-2 Incipient stage

Due to Baroclinic conditions, there is formation of low pressure which prompts confrontation between air mass.

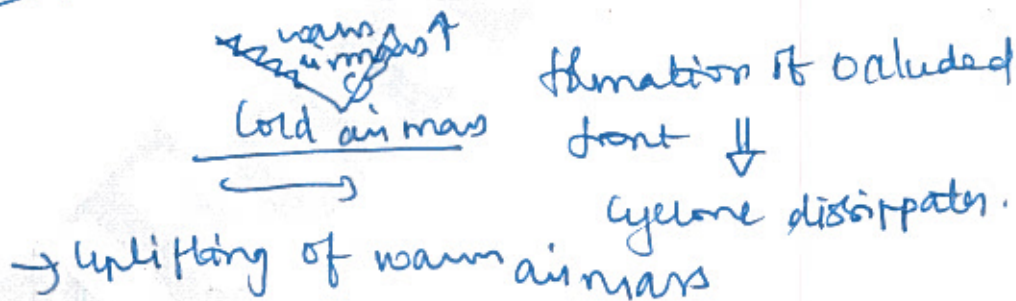


Stage-3 Mature Stage



Rainfall = cumulonimbus clouds over small area with rapid intensity

Stage-4 Senile stage



Thus, air masses help in distribution of heat through Temperate cyclones in mid latitudes.

Overall Grading (✓)

Poor			Average				Good		
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