

GS Advanced Program 2023

Generic Booklet

Test Name/Code/No. : 694049

Name			
Email ID.			
Roll No.			
Mobile No.		Date	

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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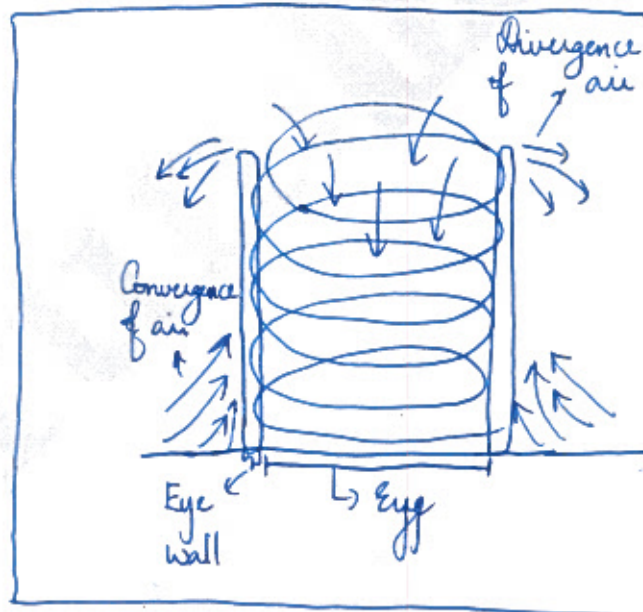
Q.1)

Tropical cyclones are largely confined to South China sea, Bay of Bengal and Gulf of Mexico. Why?

Tropical cyclones are violent storms that originate over the tropics due to the development of low pressure over the seas.

Tropical cyclones

- (i) They have no frontal system.
Heat engine is energised through latent heat of condensation



- (ii) Very destructive
(iii) Mostly occurs during summer season

Largely confined to South China sea, Bay of Bengal and Mexico

Tropical cyclones are mostly confined in

- Due to the above reasons, tropical cyclones are found in Bay of Bengal, Gulf of Mexico and South China Sea.

Poor			Average			Good		
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Q.2)

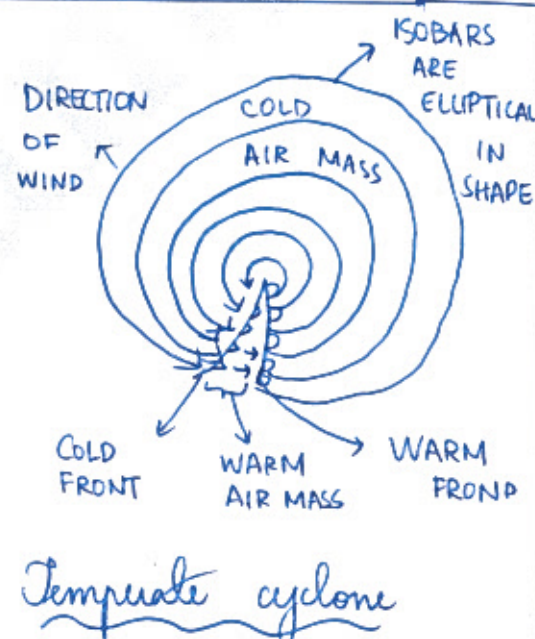
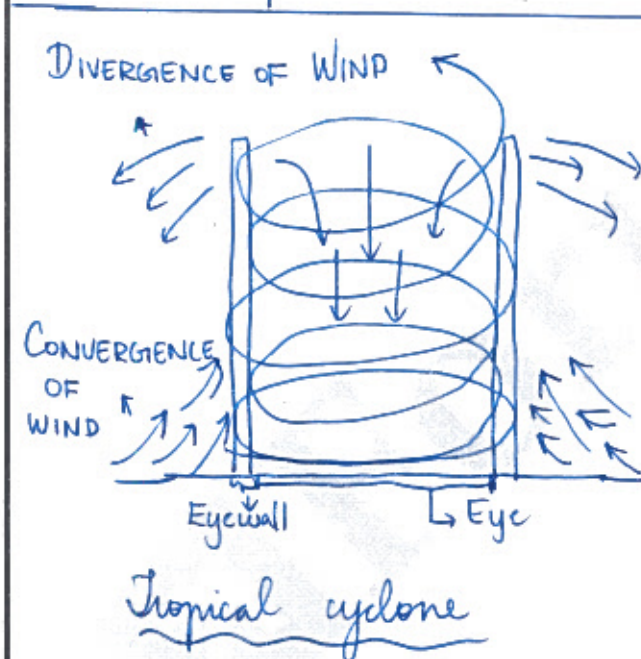
Bring out the salient differences between tropical cyclones and temperate cyclones

Cyclone is a large mass that rotates around a strong centre of low pressure. Their types include Tropical cyclones and Temperate cyclones.

Tropical cyclone vs. Temperate cyclone

PARAMETERS	TROPICAL CYCLONE	TEMPERATE CYCLONE
(i) MECHANISM OF ORIGIN	No frontal system - Heat energised by latent heat of condensation	Well developed frontal system - 2 contrasting air masses
(ii) ORIGIN	Over <u>Sea</u> only	<u>Land</u> and <u>Sea</u>
(iii) LOCATION	<u>5° - 15°</u> latitudes	<u>Middle</u> and <u>high</u> latitudes
(iv) TEMPERATURE VARIATIONS	<u>No</u>	<u>Yes</u> → due to cold and warm front
(v) Size and Range	<u>80 - 300 km</u>	<u>> 1000 km</u>

(vi) SHAPE	<u>Circular</u>	<u>Elliptical / Circular / Semicircular</u>
(vii) MOVEMENT	<u>East to West</u>	<u>West to East</u>
(viii) WIND VELOCITY	<u>120-180 km/hr</u>	<u>3-40 km/hr</u>
(ix) DESTRUCTIBILITY	<u>Very destructive</u>	<u>Less or no destruction</u>
(x) SEASON	<u>Mostly summer</u>	<u>Yearlong</u>



Considering the effect cyclones have on human settlements, the study of cyclones seems to be important.

Overall Grading (✓)

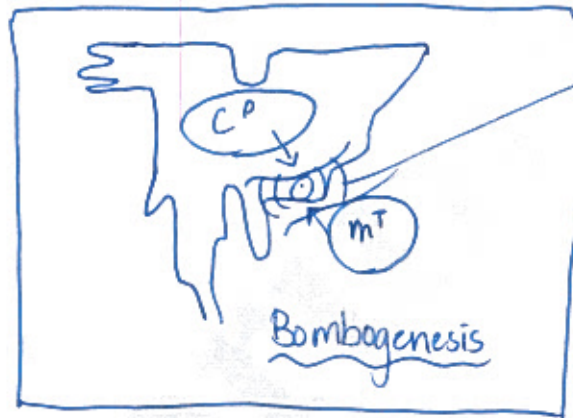
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Q.3)

Define Bombogenesis. How Bomb cyclone is different from a temperate cyclone?

Bombogenesis or bomb cyclones are intense storms caused due to development of low pressure in temperate regions.

They are destructive and causes significant impact.



→ Air pressure drops by 24 millibars in 24 hours

Reasons for formation

Development of low pressure system

low pressure warm air mass meets High pressure cold air mass

Air pressure drops by 24 millibars in 24 hours

Bombogenesis

Bombogenesis vs. Temperate cyclones

BOMBOGENESIS

- (i) Occurs during winter months
- (ii) Very destructive
- (iii) Air pressure drops 24 millibars in 24 hours
- (iv) Intensifies rapid

TEMPERATE CYCLONES

Occurs yearlong

Less or No
destruction

No drastic drop in
air pressure

No rapid intensification

Bomb cyclones are a type of Temperate cyclone which causes significant impact on the environment due to its tendency to intensify rapidly.

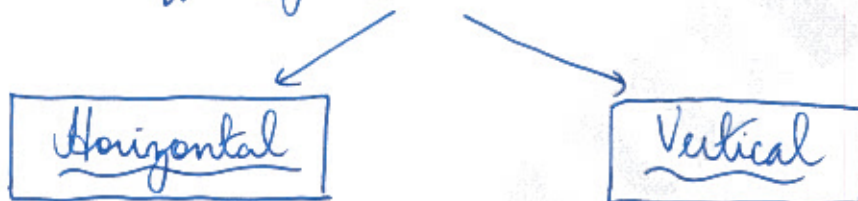
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2.4) Discuss the forces which govern the air movement on the earth's surface.

The movement of air along the surface of the earth plays a vital role in deciding weather and climatic conditions.

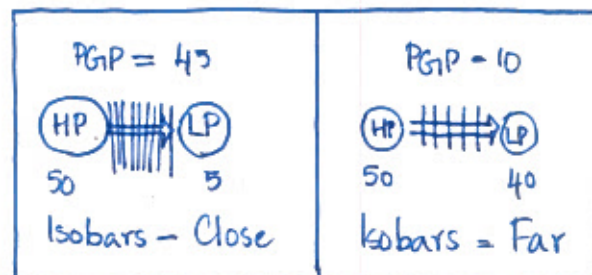
Factors affecting air movement



- | | |
|---|---|
| <ul style="list-style-type: none"> ① Pressure gradient force ② Frictional force ③ Coriolis force | <ul style="list-style-type: none"> ① Gravitational force |
|---|---|

→ Pressure gradient force

(i) Difference in atmospheric pressure produce Pressure gradient force (PGF)



(ii) PGF is strong when isobars are close and PGF is weak when isobars are apart

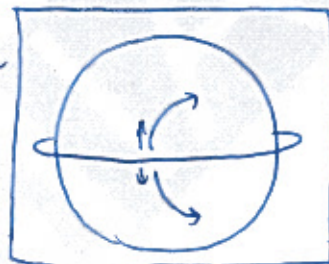
→ Frictional force

 upto 3km

- (i) It affects the speed of the wind
- (ii) It is greatest at the surface and its influence extends upto 1-3 km
- (iii) Over the sea, friction is minimal

→ Coriolis force

- (i) Rotation of the earth on its axis affects the wind direction



- (ii) It deflects the wind to the right in Northern Hemisphere and to the left in southern hemisphere

→ Gravitational force

It acts downwards and causes the air near the ground to be dense

Thus various factors influence the movement of air horizontally and vertically.

Overall Grading (✓)

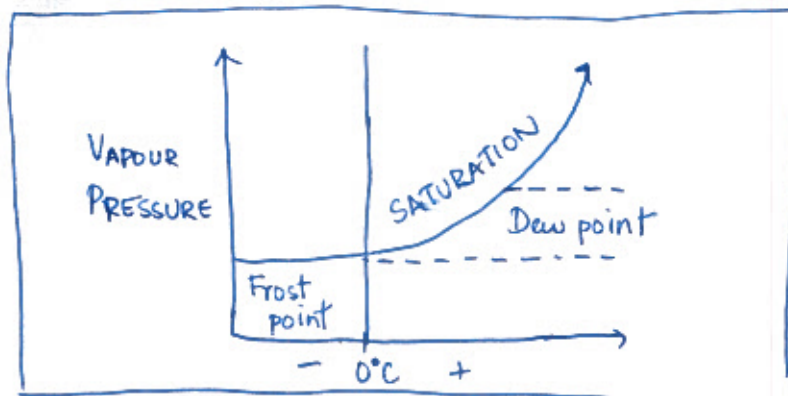
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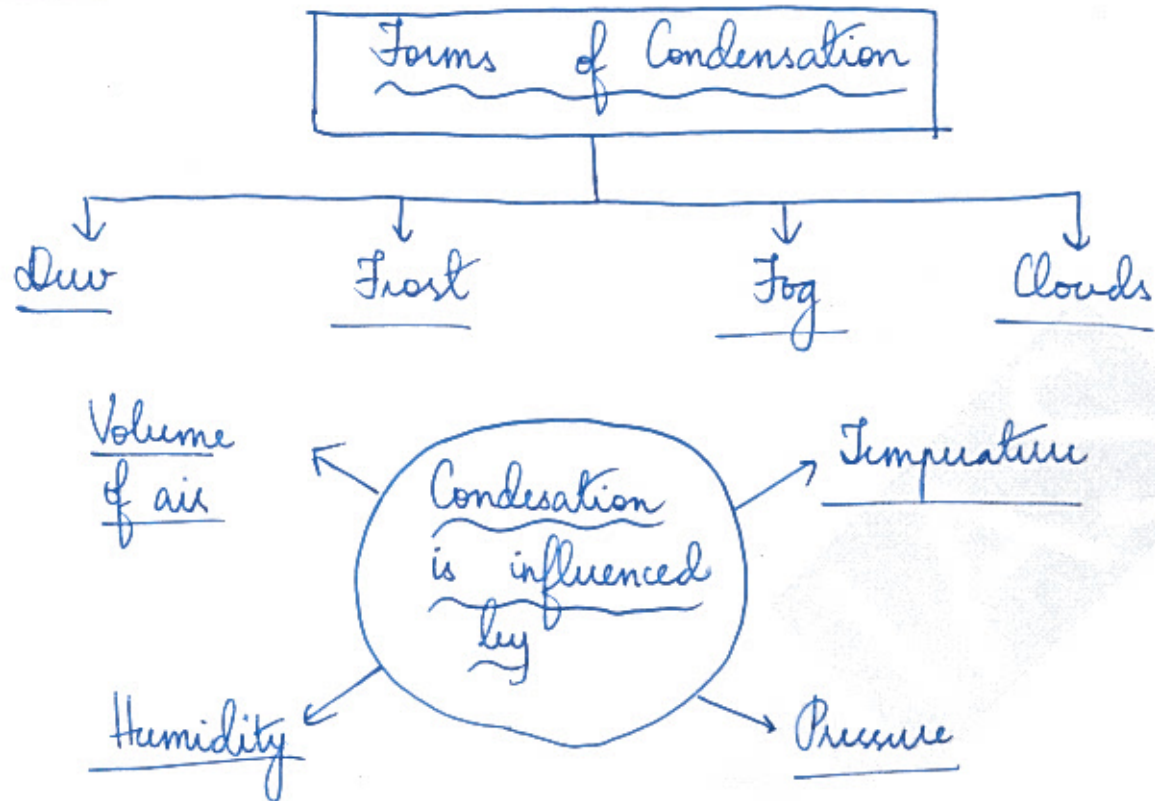
2.5) Discuss dewpoint and various forms of condensation.

The transformation of water vapour into heat is called Condensation. It is caused by the loss of heat.

Dew point

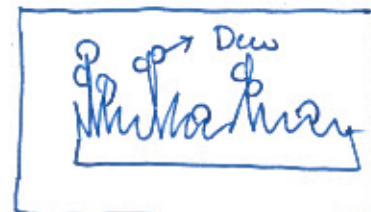
- (i) Air is said to be saturated when moisture is at its full capacity at a given temperature
- (ii) It means that air is incapable of holding any more moisture at that stage at a given temperature
- (iii) The temperature at which saturation occurs at a sample of air is called Dew point





① Dew

- (i) Moisture is deposited in form of water droplets on cooler surfaces



- (ii) Usually on grass blades, plant leaves, stones etc

- (iii) Dew point > Freezing point

- (iv) Ideal conditions
- Clear sky
 - Calm air
 - Cold and long night
 - High relative humidity

(2) Frost

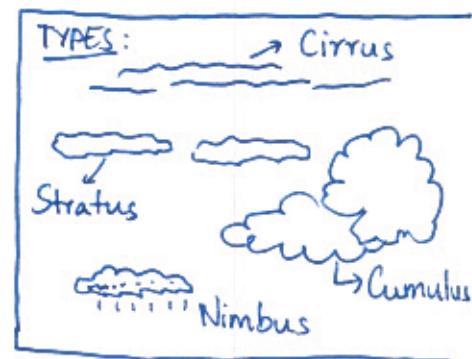
- (i) Freezing point $\geq$ Dew point $\leftarrow$ Condensation
- (ii) Excess moisture in the form of minute ice crystals

(3) Fog and Mist

- (i) Fog - Cloud with its base very near the ground $\rightarrow$ Leads to smog in cities
- (ii) Mist - More moisture than fog $\rightarrow$ found in mountains
- (iii) Condensation takes place around nuclei

(4) Clouds

- (i) Aggregates of water droplets, ice particles or mixture of both
- (ii) Condensation around nuclei



- (iii) Plays major role in heat budget

Various forms of condensation proves instrumental in determining weather conditions.

Overall Grading (✓)

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

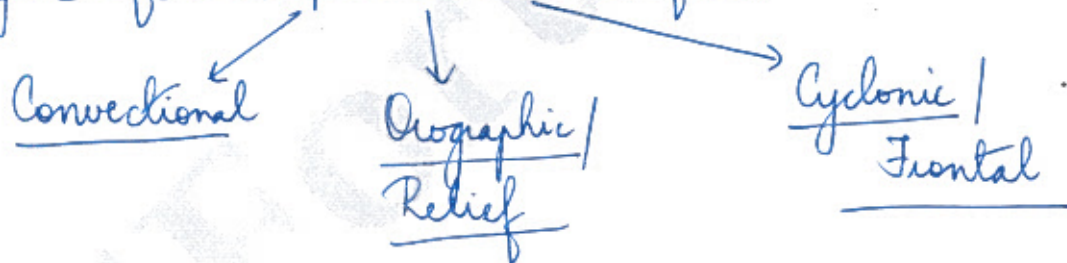
2.6)

Give an account of the types and distribution of precipitation on the surface of the earth.

Precipitation refers to the release of moisture after the process of condensation of water vapour.



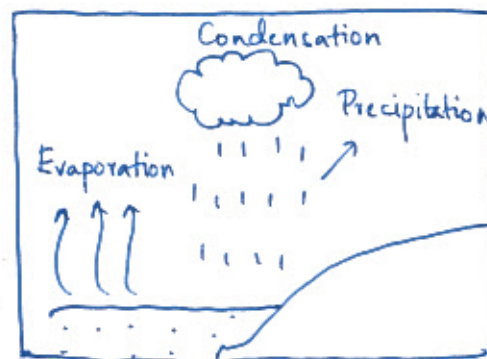
Types of Precipitation (Rainfall)



① Convective Rainfall

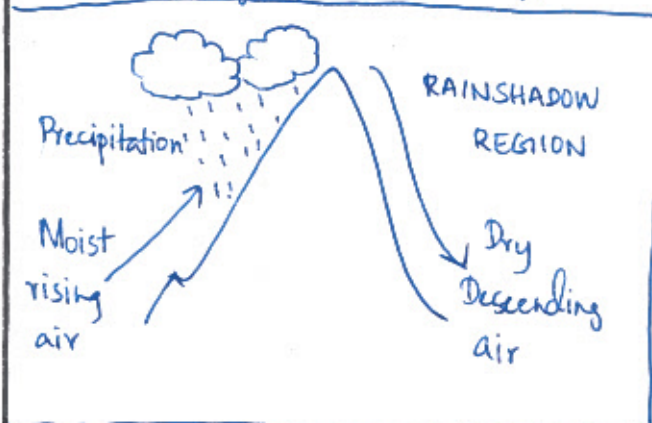
(i) Warm moist air → uplifted ^{due} to heating of land → expands and loses heat → Condensation

(ii) Common during summer



(iii) Usually common in equatorial regions and interior parts of continents

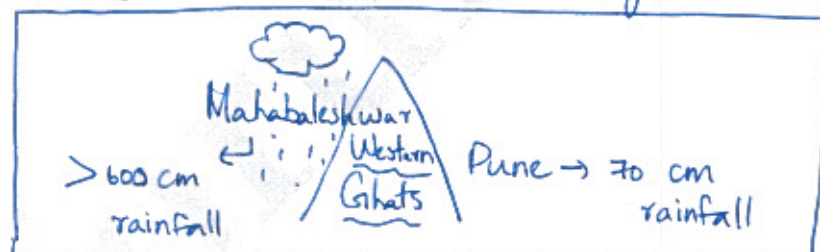
② Orographic rainfall



(i) Saturated air mass comes across a mountain → forced to ascend → temperature falls → Condensation

(ii) Windward side - greater rainfall
Leeward side - Rainless & Dry

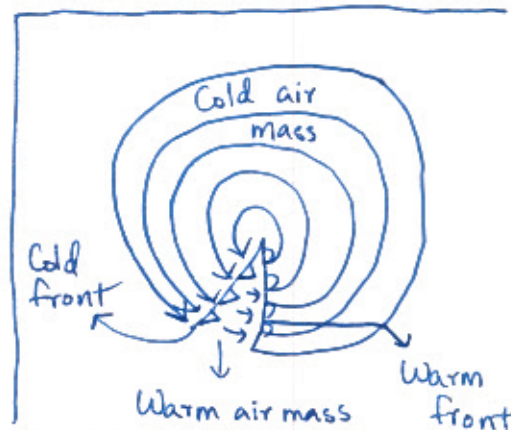
(iii) eg.



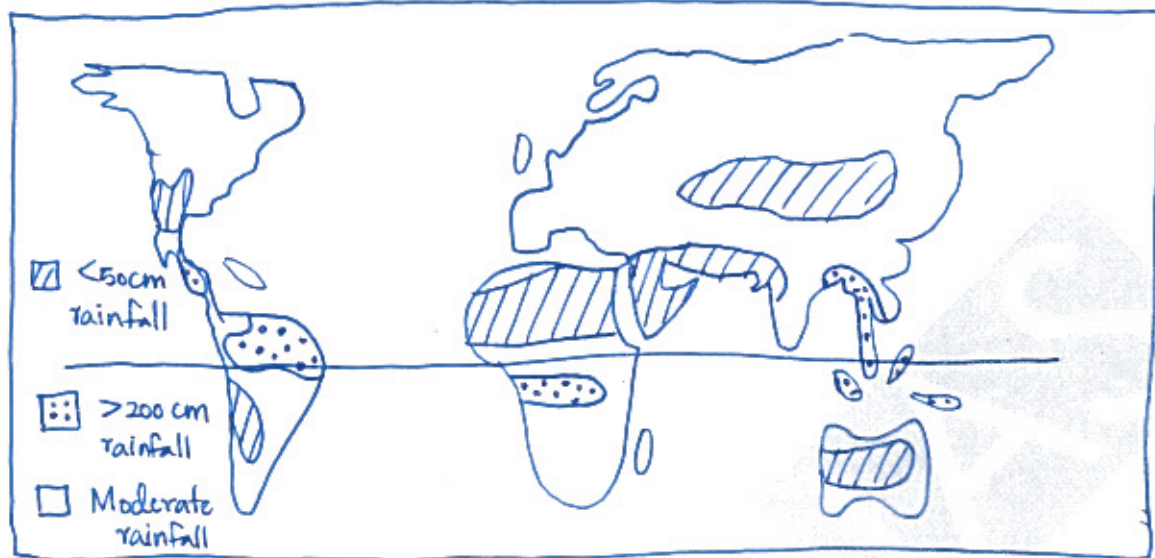
③ Cyclonic rainfall

(i) Occurs due to meeting of fronts or due to formation of cyclones

(ii) eg. Rainfall along North West Europe



Distribution



- (i) Rainfall decreases as we move from equator to poles
- (ii) Coastal areas - $\uparrow$ rainfall
- (iii) >200 cm rainfall - Equatorial belt, Coastal areas in monsoon land, Windward side of mountains in West coast in temperate region
- (iv) 100-200 cm rainfall - Interior continental areas
- (v) <50 cm rainfall - Rain shadow zones of mountains in interior of continents

Precipitation in the form of rainfall is essential for economic growth in India

Overall Grading (✓)

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

Q.7)

Define air masses. How do they originate?
Bring out their role in influencing climatic patterns around the world.

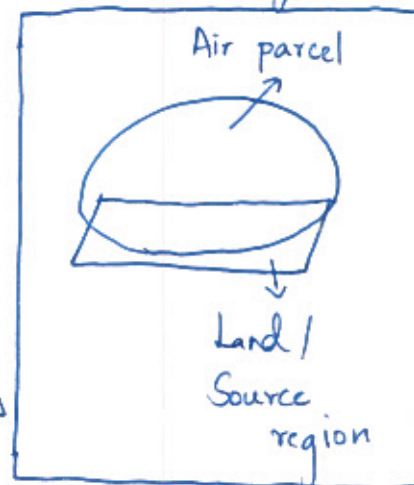
Air masses may be defined as homogenous pockets of air in which the upward and horizontal variations in temperature and humidity are fairly uniform over an extensive area.

When the air remains over a homogenous area for a sufficiently long time, they acquire the features of that area.

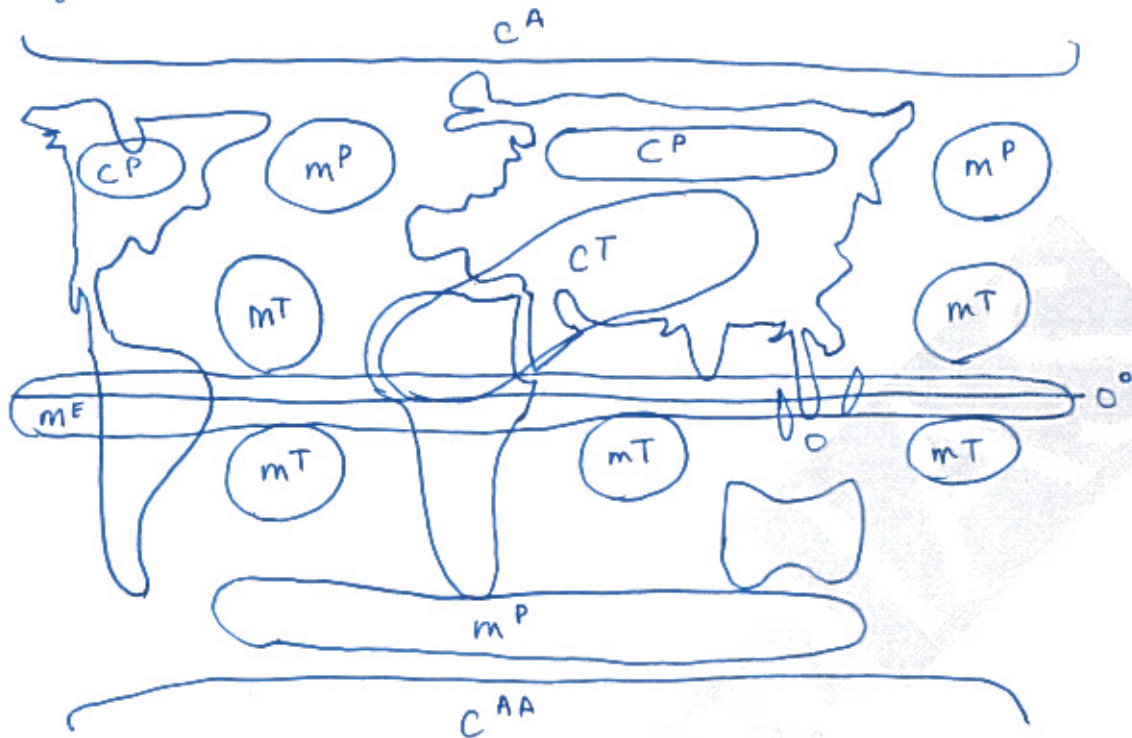
ORIGIN :

Air masses originate over area (source region) that are

- (i) Extensive and homogenous
- (ii) No convergence of air, only divergence
- (iii) Stable atmospheric conditions



Major air masses

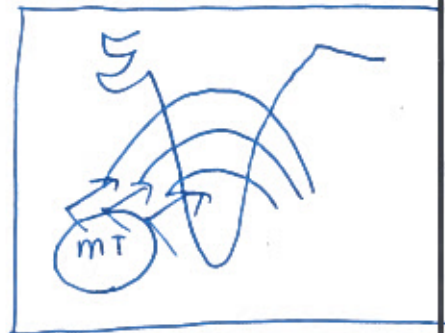


- m^T - Maritime Tropical
- m^P - Maritime Polar
- C^A - Continental Arctic
- C^T - Continental tropical
- $m^C P$ - Continental polar
- C^{AA} - Continental Antarctic

Influence on climate patterns of the world

(i) Summer monsoon of India

Maritime tropical air masses provide monsoon conditions in South Asia



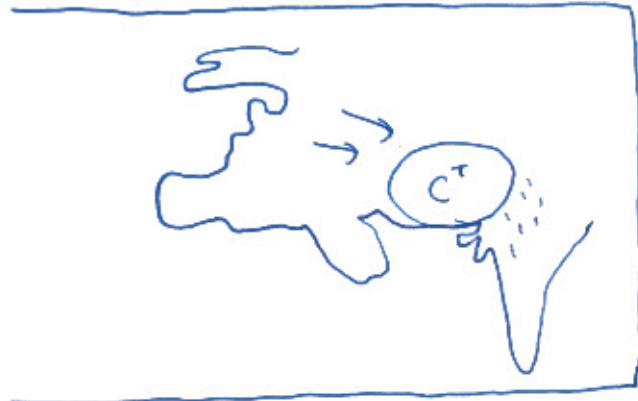
(ii) Temperate cyclones

The process of frontogenesis is responsible

for instability in mid latitude climate



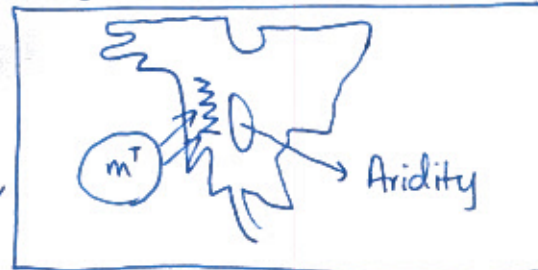
(iii) Western disturbances



They bring rainfall to Northern part of India during winters and are helpful for Rabi crops

(iv) Drought of Great Plains of USA

The maritime air mass moves towards Rockies and causes aridity along great plains



(v) Black rain in Italy

The dry continental air mass from Africa moves to Italy, causing rainfall.

Thus air masses play an important role in influencing climate of the world.

Overall Grading (✓)

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

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