CHAPTER

Q.1. Define meteorology and Explain scope and importance of Meteorology

Ans :-

Meteorology :

It is study of lower atmosphere

OR

It is science of atmosphere or its phenomenon specially those phenomenon which collectively called weather and climate

OR

It is science of atmosphere which deals with physics, chemistry and dynamics of atmosphere and their direct and indirect effect on earth, oceans and life.

Agril. Meteorology

Meteorology in its relation to agriculture

OR

It is applied branch of meteorology which deals with the relationship between weather, climate, life and growth of cultivated crop or plants and animals

Importance and scope of meteorology

Scope of meteorolcgy in different fields are as follows

1. Fisheries
   - Fisherman need information about ocean conditions and atmospheric condition before they go to fishing.
   - This knowledge provided by meteorology
2. Animal production
   - Generally poultry, animal and milk, beef production depends upon weather.
   - Meteorology provide knowledge for successful animal production.
3. Navigation
   - Knowledge of ocean waves, high speed wind, cyclonic storm, large tidal waves in needed for safe navigation on sea.
   - This weather forecasting supplied by meterology.
4. Aviation
   - Information about electric lightening high speed wind and their direction thunder storms, foggy atmosphere in needed to pilots for safely transportation through air.
   - This accurate forecasting given by only meteorology
5. Industries
   - Number of industries totally depends upon agriculture sectors for their row materials.
   - The location of industries totally depends on agricultural area and weather of that climate.

- Successfulness of industries related to weather given by meteorology

6. Irrigation and water resources
   - Meteorological and hydrological information is needed for deciding location, size and storage capacity of dam
   - It is for water supply for irrigation and domestic purpose.
   - When to and how to irrigate the field decided by meteorological information.
7. Land use planning
   - Meteorological data provide information about soil and topographics.
   - This information is useful to land use for industry, crop production, forest or residues.
8. Human health
   - Asthma patients suffer more in cloudy conditions.
   - Sudden change in climatic conditions resulted epidemics of malerial fever
9. Human life
   - Human being try to adjust himself as per weather condition.
   - e.g. Warm cloth in winter, cold and thin cloth in summer.
   - Direction of window, door for ventilation.
   - Heavy diet in winter and water required more in summer seasons.

Q. 2. [illegible] Agriculture ?

Ans :- Importance and scope of Meteorology in Agriculture

1. Management of crop
   - Crop managements practices such as sowing, fertilizer application, plant protection, irrigation scheduling, weeding, mulching, thining, harvesting are depends on weather information.
   - For that agromet advisory forecast should be use.
     1. Fertilizer application should be done when rainfall is not heavy, wind speed is < 30 km/hr and soil moisture is between 30-80%
     2. Weeding, harrowing, mulching should be done during dry spells forecasted.
     3. Spraying/dusting should be done when no rainfall, soil moisture is 90% and wind speed is less than 25 kg/hr.
2. Crop planning
   - By use of climatic information we reduce risk of crop failure under adverse condition and stabilize our yield.
   - Suitable crop, cropping pattern contingency cropping planning can selected by considering water requirement of crop effective rainfall and available soil moisture.
3. Characteristic of Agricultural Climate
   - Growth development and yield of crop are totally depends on crop growing season solar radiation, air temperature, precipitation wind, humidity etc.

- Agro-meteorology provide information about these parameter of particular area for getting maximum production and economical benefits.

4. Crop modeling
   - Suitable crop models provide information about growth and yield of particular crop when current and past data is available.
   - These data information provided by meteorology.
5. Crop monitoring
   - By use of crop growth models water balance technology or remote sensing we check the crop health and growth performance of crop.
6. Research
   - Agro-meteorology can helps to understand crop-climate relationships.
   - By use of these information we develop plant process in relation to micro-climates.
   - Scientists know the adverse effect of climates.
7. Adverse climate प्रतिकूल वातावरण भविष्य
   - Adverse climate like frost, flood, drought, hail storms, high winds can be forecasted it protect the crop
8. Soil formation
   - Climate in major factor for soil formation because soil formation process is totally depends on temperature, precipitation, humidity of wind.
9. Livestock production
   - Agricultural meteorology studied the set of favourable and unfavourable weather conditions which are responsible for growth, development and production of livestock.
   - Thus optimize the milk production and poultry production.
10. Moisture stress
    - Soil moisture determined from climatic water balance method which is used to diagnose soil moisture stress and drought.
    - Undertake protective measure such as irrigation, mulching, antitranspirants, defoliation thinings etc.

Scope & Imp in Ag of Meteorology in Agri.

① Management of crop
② Crop planning
③ characteristic of Agricultural climate
④ Crop modeling
⑤ Crop monitoring
⑥ Research
⑦ Adverse climate
⑧ Soil formation
⑨ Livestock production
⑩ Moisture stress

Q 1 . Define weather and climate and differentiate it ?

Ans :

[redacted]

It is physical condition of atmosphere of particular time and place

[redacted]:

Average condition of weather of place and time

DIFFERERENCE BETWEEN WEATHER AND CLIMATE

[redacted]	[redacted]
1. Physical condition of atmosphere at particular place.	1. It is long term average atmosphere condition of particular place.
2. Weather changes to specific instant of time (day or week)	2. It is generalized over long time or span for longer area
3. It expressed in numerical value of meteorological elements.	3. It expressed in terms of time average and area average of meteorological elements.
4. It measured in observatory	4. Its information derived from regional basis.
5. It required single observatory	5. It required series of observation over region.
6. No statistical treatment is applied to meteorological elements.	6. Application of statistical treatments over longer period is done.
7. It provide meteorological information.	7. It provide geographical information related to weather.
8. Weather of two place having same numerical value must be same	8. Climate of two place having same average weather can not same.
9. it categorized as fair, unfair, excellent	9. Climate classification desert, marine, tropical, climate.
10. Weather decides the success or failure of a crop in particular season.	10. Climate decide the types of crop suitable for a region.
11. Adverse weather resulted into crop failure and short term contingent crop planning	11. Climate required long term agriculture planning.

Q 2 . Define weather and climate and explain climatic factors ?

Ans :

Weather :

It is physical condition of atmosphere of particular time and place

Climate :

Average condition of weather of place and time

CLIMATIC FACTORS

1. Vegetation

The dense vegetation has higher evapo-transpiration rate and thus increasing humidity and rainfall of the area. It also reduces the relation receipt and wind.

2. Snow and ice

Snow increases annual range of temperature by increasing relation during winter.

3. Ocean currents

Ocean currents have a considerable influence on the climate of the coastal regions and islands near which they flow. The warm currents tend to raise the temperature of the place while the cold currents make a place colder. Winds passing over the warm currents absorb a good deal of moisture and brings heavy rains over the coastal areas on the other hand, winds passing over the cold currents become dry and cool and bring little or scanty rainfall.

4. Land and sea distribution

Distribution of land and sea has a profound effect on climate. Places near the sea have moderate climate. On the other hand places far away from the sea are very hot in summer and very cold in winter. So they are said to have an extreme climate.

5. Mountains

High mountain chains act as a barriers to free flow of winds and divide one type of climate zone from another. For example moist monsoon current of the Indian sub-continent is not allowed by the Himalayas to cross over Tibet and cold Polar air from the north is restricted by the Himalayas from crossing into our country in winter.

6. Topography

Wind velocity primarily changes with change in topography which may result in change in temperature.

7.Altitude

Pressure and temperature decreases with increase in altitude.

8. Latitude

The most important influence of latitude is on temperature of a place. Temperature tends to decrease with increase in latitude, Places far away form the equator are colder than those near it. This is because the angle of the sun's rays decreases as we go to higher latitudes and also the rays have to pass through a greater distance of the atmosphere before they strike the earth's surface. They have therefore less heating effect than the rays falling on the equatorial region.

- Snow & ice
- Ocean current
- Land & sea distribution
- mountains
- Topography
- Altitude
- Latitude

Q. 1. Define atmosphere explain importance of atmosphere

Ans :-

Atmosphere

It is gaseous envelcpe surrounded the earth

Importance of atmosphere

1. Atmosphere prcvide essential moisture.
2. It protect biological life from ultraviolet light.
3. It fulfill basic requirement of CO_2 which is essential for photosynthesis
4. It provide media for transmission of seed, spore, pollens and insects.
5. Atmosphere is responsible for many chemical, physical and hydrological process.
6. It act as receiver of N_2
7. It fulfill the demand of O_2 animal life.

Q. 2. Define atmosphere? Explain details composition of atmosphere ?

Ans :-

Atmosphere

It is gaseous envelope surrounded the earth

Composition atmosphere

- Component of atmosphere divided into 3 groups.

1. Gases :- N_2, O_2, Ar, CO_2, O_3, SO_2, HO_2, NH_3, Co, Ne, He, H, Kr, Xe, CH_4, N_2O, Rn
2. Moisture :- Water vapours
3. Solid particles :- Carbon, dust and salt particles, water droplets, spores, pollens, seeds

Non variable component

- Some gasses of atmosphere remain constant in atmosphere into height – 80-88 km. These are called as non-variable components.
- e.g. N_2-78.084%, O_2 - 20.94%, CO_2-0.032%, Ar - 0.93%, CH_4 – 1.5 x 10^{-4}

Variable components

- Component of atmosphere which are changed with change in time, place, season etc. called variable components.

e.g. Water vapours – less than 4%, Ozone -- less than 0.07 x 10^{-4},

NO_2 – less than 0.02 x 10^{-4}, Dust – less than 10^{-5}

Compositional layering of atmosphere

Homosphere

Atmospheric region upto 88 km have different gases and they are thoroughly mixed and homogenious by process of turbulent mixing and diffusion called homosphere.

Heterosphere

In heterosphere gaseous composition changes and it make separate layer.

Hydrogen	10000 km
Helium	2400 km
Atomic oxygen	965 km
N_2 and part of O_2	200 km
Homosphere	115 km
Earth	

Nitrogen and oxygen - From 88 to 115 km
Atomic oxygen - 115 to 965 km
Helium layer - 965 to 2400 km
Hydrogen - 2400 to 10000 km

Q. 3 Define atmosphere and explain physical structure of atmosphere

Ans : - Atmosphere

It is gaseous envelope surrounded the earth

PHYSICAL STRUCTURE/LAYERING/STRATIFICATION OF ATMOSPHERE

- On the basis of vertical difference of temperature atmosphere is divided into following layer

1. Lower atmosphere a) Troposphere b) Stratosphere
2. Upper atmosphere a) Mesosphere b) Thermosphere

1. Lower atmosphere

a) Troposphere

- Altitude of troposphere changes as per latitude.
- Height of troposphere at pole is 8 km and at equator in 16
- Average height of layer is 11 km
- This layer contain 75% of gases of atmosphere
- Cloud formation, storms are formed in this layer.
- Temperature of layer is 20°C to –60°C .
- Isothermal layer present in between troposphere and stratosphere called as tropopause.
- Decrease temperature when increase in height at rate of 6.5°C/km.

b) Stratosphere

- This is second layer of atmosphere
- Present in between 11 to 50 km from ground surface.
- Stratosphere contain ozone layer
- ozone layer project the human life from ultra violet light.
- Density of ozone is maximum at 22 to 25 km height.

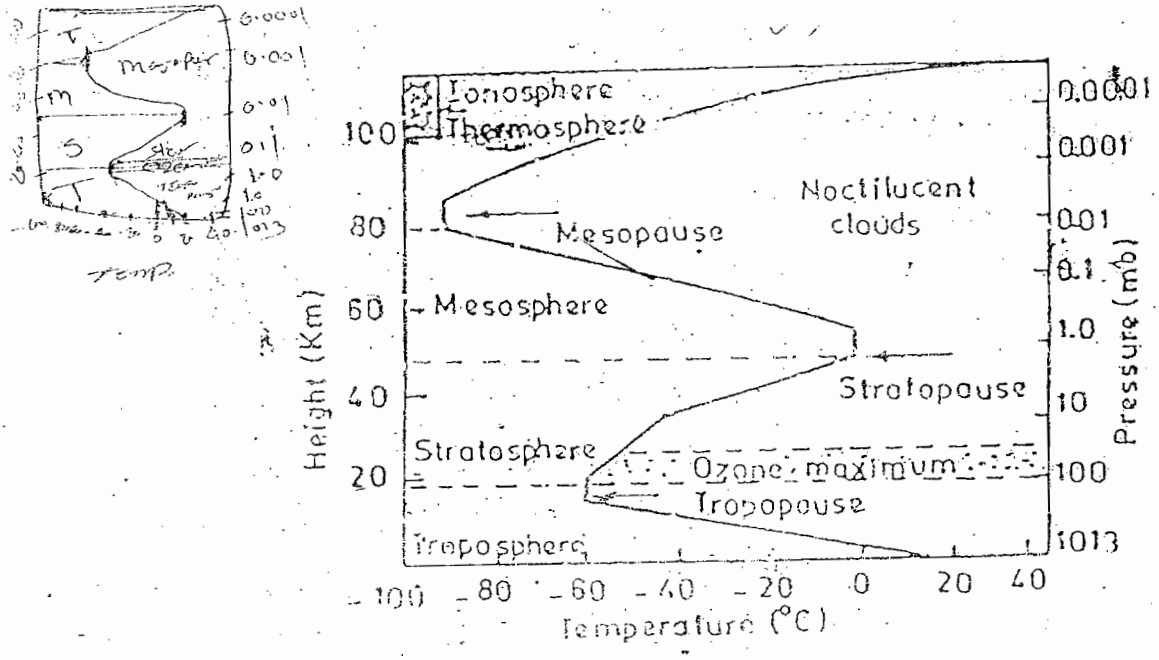
2. Upper atmosphere

a) Mesosphere

- It is 3rd layer of atmosphere
- Observed in between 50 to 80 km
- Temperature decreases with increase height to a minimum temperature i.e. –90°c at 80 km.
- Pressure at 50 km is 1mb and at 80 km 0.01 mb.
- Isothermal layer which separate mesosphere and thermosphere called as mesosphere.

b) Thermosphere

- It is outermost layer of atmosphere
- It observed above 80 km
- In it atmospheric density is low.
- Temperature of this layer increases with increase in height due to absorption of ultra violet light.
- Temperature reaches at 950°C at 350 km and 1700°C above limit.
- Satellites are rotated in this layer.



Vertical structure of atmoshere based on temperature variation

Q.Define air temperature ? Explain in details classification of air temperature and factors affecting air Temperature

ANS :

Temperature : *It is degree of hotness or coldness*

Classification of air temperature

A) Periodic Variation-- a) Annual temperature Variation / cycle
b) Daily temperaiure Variation / cycle

B) Horizontal Variation

C) Vertical Variation

A) Periodic Variation

- Temperature continuously change during a day week month or year this change is called as periodic variation

a) Annual temperature Variation / cycle

- Annual temperature give raise to season i.e summer and winter
- Annual temperature differ from place to place.
- Increase from mid winter to mid summer
- Decrease from mid summer to mid winter.
- North himesphere winter is high in January and summer is high in July vice versa in south hemisphere.
- Difference between maximum temperature and minimum temperature called as temperature range.
- North hemisphere summer is 21st March to 22nd September winter 23rd September to 20 March.

b) Daily Temperature Cycle

- It gives rise daily maximum and minimum temperature.
- From sun rise energy continuously supply to earth and recording maximum temperature at 2-4 pm.
- Delay in heating of maximum temperature caused by gradual heating of air by heat transfer from ground called thermal lag.
- Minimum temperature occurs shortly after sunrise due to lag in transfer of heat from surface to air.

B) Horizontal temperature variations

- The rate of change of temperature with horizontal distance called temperature gradient
- Maximum solar energy in received in equational regions so highest temperature are observed in equatorial regions.
- Latitude increase it degrease solar energy so that temperature is also decrease.

are observed.

- Isotherm : It is line on weather map which join the places of equal temperature.

C) Vertical Temperature Variations

- On the basis of temperature variation atmosphere is divided in to 4 spheres

1. Troposphere :
   - Temperature decrease from 15°C at earth surface to –60°C at 11 km height
2. Stratosphere :
   - Temperature increases from –60°C to 0°C at 50 km height.
3. Mesosphere:
   - Temperature decrease about –90°C at 80 km height
4. Thermosphere:
   - Temperature increase about 950°C at 350 km height and 1700°C on ward height.

FACTORS AFFECTING AIR TEMPERATURE

1. Latitude
   - Highest temperature at equator and lowest at pole
   - Temperature decrease with increase latitude
2. Altitude
   - Temperature decrease with increase altitude
3. Season
   - Minimum temperature in winter and maximum temperature in summer
4. Topography
   - Mountain act as obstacle to flow of cold air
   - It set warm winds
5. Ocean currents
   - Hot and cold ocean current affect temperature
   - e.g. Gulg stream (Warm) N – Atlantica
   - e.g. Peru Current (Cold) S-America
6. Wind
   - It affect air temperature
7. Clouds and Rains
   - Clouds by absorbing the radiation and rain by cooling atmosphere affect the temperaiure.
8. Colour of soil
   - Black soil absorb more heat and other soil type reflect the heat
9. Slope of land
   - Perpendicular rays impact more heat than parallel rays
10. Forest and vegetation
    - Due to more ET temperature is affected in particular area.

Q.1 Define soil temperature and explain in details importance of soil temperature in agriculture

Ans :-

Soil temperature :

It is degree of hotness or coldness

IMPORTANCE OF SOIL TEMPERATURE IN AGRICULTURE

1. Prevailing soil temperature affect
   - Rate of absorption of water
   - Rate of growth of undergound part of plant i.e. root
   - Soil physical, chemical, biological properties.
2. Plant growth is less when temperature below 9°C and above 50°C
3. Soil temperature affect the germination of seed e.g. maize required temperature for germination i.e. 7-10°C, cotton – 10-15°C.
4. Most optimum temperature i.e. 25-35°C is for microbial activities
5. Optimum soil temperature for nitrification in 32°C
6. Soil temperature affect the decomposition of micro organism
7. It affect absorption of water
8. It affect availability of nutrients

Q.2 Write down thermal properties of soil factors affecting soil temperature

Ans :-

THERMAL PROPERTIES OF SOIL

1. Specific heat/mass specific heat
   - Amount of heat required to raise temperature of 1 g substance by 1°C. 1g – 1°C
   - Specific heat of minerals 0.18 to 0.20 cal/gm
2. Heat capacity (Volume specific heat)
   - Amount of heat required to raise temperature of one cubic centimeter substance by 1°C. 1 cal/cm – 1°C
   - Heat capacity of soil 0.3 to 0.6 cal/cm^3
3. Thermal conductivity
   - It is ability of substance to transfer heat from molecule to molecules
   - It expressed in $Jm^{-1}s^{-1}k^{-1}$ $Jm^{-1}s^{-1}k^{-1}$
4. Thermal diffusivity
   - It is ratio of thermal conductivity to volume specific heat.

$$\text{Thermal diffusivity} = \frac{\text{Thermal conductivity}}{\text{Volume specific heat}}$$

1. Solar radiations
   - Amount of heat reaches from sun to earth 2.0 cal/cm²/min
   - Amount of radiation received by soil depends on angle of soil expose to sun
2. Condensation
   - Water vapors from soil and atmospheric condenses in soil and heat increases
3. Evaporation
   - Greater rate of evaporation soil will cooled.
4. Rain fall
   - Cool down the soil
5. Vegetation
   - Barren soil absorb more heat in summer and become more cold during winter
   - Vegetation not give permission to soil for hot in summer and cold in winter
6. Colour of soil
   - Black soil absorb more heat than light colour soil
   - So that black soil are warm than other soils.
7. Moisture content
   - Soil with more moisture content is cool than dry soil
8. Tillage
   - Cultivated soil have more temperature than non cultivated soil
9. Soil texture
   - It affect thermal conductivity of soil
   - Thermal conductivity reduce by change in particles size
10. Organic matter
    - It reaches T.C. and H.C.
    - It increase WHC
11. Slope of land
    - Soil have more slope it reduce temperature of soil as compared to less slope land.

Q. Define radiation and explain significance of radiations in agriculture ?

Ans :- Radiation

Transfer of heat in form of electromagnetic waves with speed of light called radiation

Significance of radiation in agriculture

1. Provide energy for all vegetation for production of biomass
2. Provide energy for photosynthesis
3. Provide energy for physiological process of plant, soil and atmosphere
4. Radiation decide yield of crop
5. It make balance of atmosphere
6. It make balance of temperature
7. Provide energy for
    1. Protein synthesis
    2. Carbohydrate synthesis
    3. Germination
    4. Elongation
    5. Microbial activity
    6. Reproduction
    7. Flowering pigmentation
    8. Leaf enlargement
8. Used for dry the pulses in pulse industries
9. Reduce chilling industries in very high cool area

Q. Short notes on followings

1. Laws of radiation :

Radiation reaching to earth from sun, atmosphere and form earth to atmosphere, space it follows physical laws called laws of radiations

a) Plank law

Electromagnetic waves consist a stream or quanta or flow of particles and each quantum having energy content.

$E = hv$

h – Plank constant (6.62×10^{27} arg/sec)

v- Frequency of electromagnetic length

- Greater frequency of short waves length greater is energy of quantum

2. Stefen Boltzman law:

Intensity of radiation emitted by radiating body is proportional to fourth power of its absolute temperature.

$E = \delta T^4$

E = Emmitivity of body δ = Stepen's constant (5.67×10^{-8} $Wm^{-2}K^{-4}$)

T = Surface temperature of body in ^0K

3. Wein displacement law :

Wavelength of maximum intensity of emission is inversely proportional to absolute temperature of that body.

λ Max (μm) = 2897 T

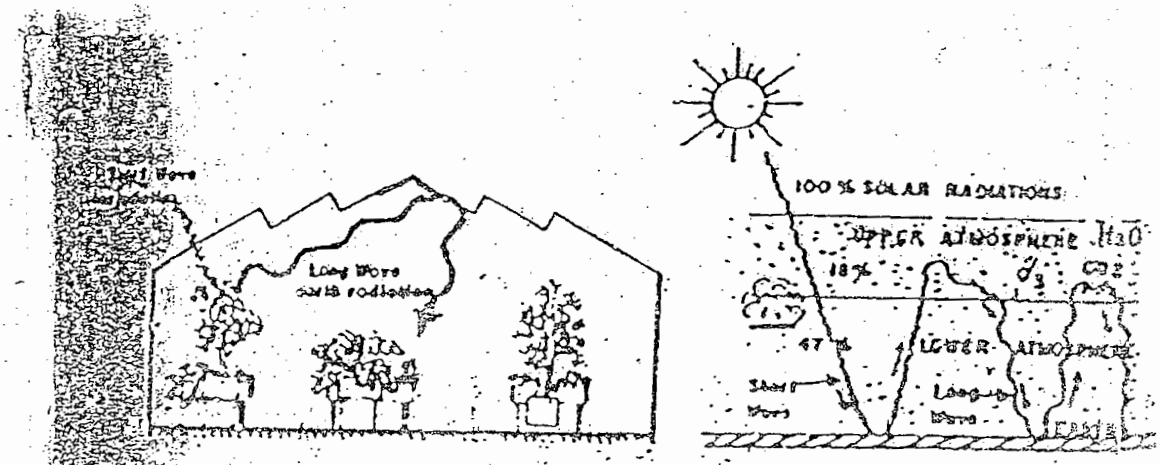
4. Kirchoff's law :

Obsorptivity of material for radiation of specific wave length in equal to its emissivity for the same wave length at same temperature.

$a(\lambda) = E(\lambda)$

II. Green house effect :

- Out of total solar radiations 47% radiations absorbed by earth surface
- Short wave length emitted from sun penetrate the atmosphere without observed.
- These short radiations absorbed by earth surface.
- Ground surface reflect the radiation on long waves.
- They observed in atmosphere by water vapour, CO_2 and ozone
- By absorbing radiation by gases, gases become warm
- Then it reflect radiation towards ground surface it increase warmness of earth surface.
- Gases namely water vapour CO_2 and ozone allow the solar radiation i.e. short waves to pass through atmosphere towards earth surface. But not allow to long waves which is emitted from earth surface called green house effect.
- This heat behaviour is similar to green house/roofed glass house.
- Green house effect keep the earth warm and do not allow the temperature falls.
- Mean temperature of earth is 15°C since long and similar temperature maintaining by green house effect



Green house effect in the Atmosphere and in Glass house

Q. Explain in details heat exchange system of atmosphere

OR

Q. Explain energy budget of atmosphere

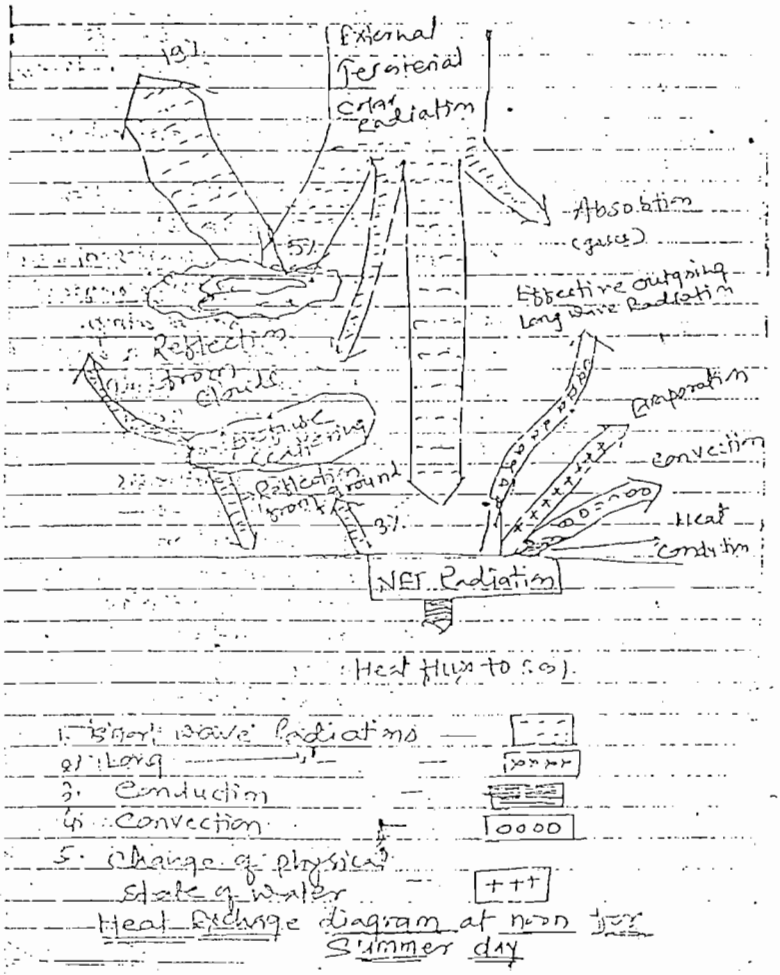


Fig. Heat Exchange system

Heat exchange system

Heat exchanged by

1. Short waves radiation
2. Long waves radiation
3. Heat conduction
4. Convection
5. Change of physical state of water

Short wave radiation:

- Radiation with wave length of 0.3-4.0 µm is called in short wave radiation
- Short wave radiation penitrate the atmosphere reaches to ground surface
- Out of total radiation some part absorbed by clouds and atmosphere i.e. cloud 5%, atmosphere 20%, earth surface 47%.

- Reduction with wave length of 4.0-100 μm is called as long wave radiation

After absorbing short wave radiation by clouds atmosphere and earth surface. Some radiations they reflected by clouds of atmosphere, earth surface in for of long waves radiation.

Cloud	-	19%
Atmosphere	-	06%
Soil surface	-	03%

- Long waves reflected from soil surface they reaches to cloud, gases water vapors ozones layers and reflect to soil surface on long waves and increase warmness of earth atmosphere
- Balance energy after gain and loss of both short wave and long waves radiation called as net radiation.
- This energy generally transfer to atmosphere by conduction convection and ET.
- **Conduction :** Heat transfer from one dust/ soil particle to another particles in atmosphere called conduction.
- **Convection :** It transfer from one molecule to another molecule of gases or liquids in atmosphere called convection.
- **Evaporation :** Heat transfer in atmosphere in form of vapours

CHAPTER

Q. 1 Define wind, air current and explain role of wind in agriculture

Ans :-

Wind

The air moving horizontally on the surface of earth called wind

Air current .

Vertical movement of air resulting from convection or any other cause called air current

ROLE / IMPORTANCE / EFFECT OF WIND IN AGRICULTURE

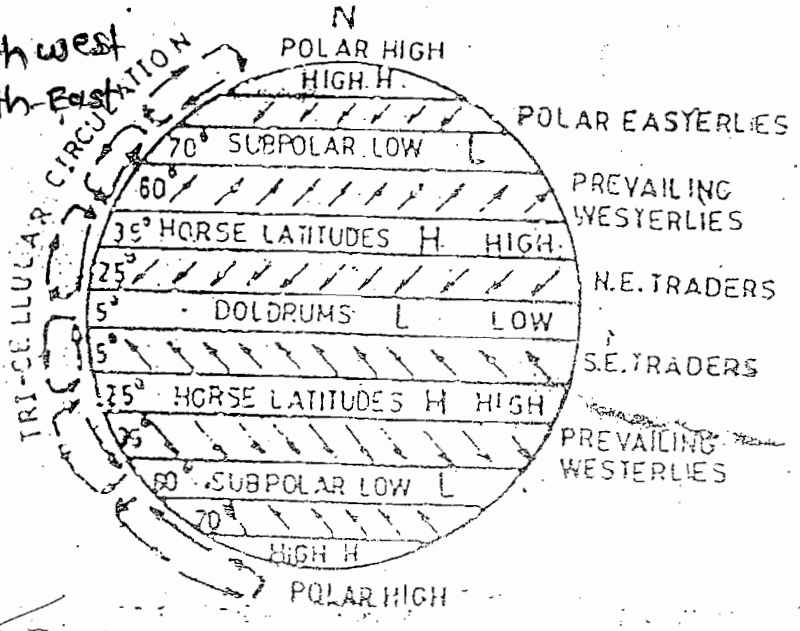
1. Wind increase transpiration
2. Wind increase CO_2 supply and photosynthesis
3. Hot wind cause desiccation of plant.
4. Hot and dry wind male cell expansion and early maturity.
5. Strong wind cause lodging of crop
6. In Coastal area strong wind bring salt and make soil unsuitable for cultivation of crop.
7. Strong wind affect crop life physiologically and mechanically.

Q. 2 Define wind ? Explain classification of wind

CLASSIFICATION OF WIND

1. Surface wind/earth general circulation ① Trade ② wester lies ③ polar
2. Local winds
   a) Land and sea breeze
   b) Mountain and valley breeze
   c) Ketabatic wind
   d) Foehn wind
3. Periodic wind — south west North-East

Imp 1. Surface wind



Earth's General circulation system of wind

Greatest heat and expansion cause increase of air and create low pressure belt at 5⁰ N to 5⁰S called equatorial grow.

- Increase in air from equator cause increase pressure at 35⁰N x 35⁰S latitude it is called as sub tropical high or horse latitude belt.
- Wind flow from horse latitude to equatorial region called trade wind
- Blow of air from equator and accumulation of air over 25-30⁰ latitude create high pressure belt region of descending air called as Hadley cell

b) Wester lies wind

- Wind situated at about 60-65⁰ latitude of a low pressure area in both hemisphere called sub pollar low.
- The wind that flow from sub tropical high pressure area to low pressure area situated at 60-65⁰ latitude in both hemisphere called wester lie wind.
- In upper atmosphere reverse air movement take place called forel cell.

c) Polar wind

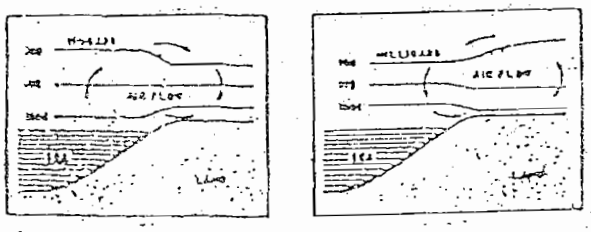
Wind flow from polar high to sub polar low pressure area at 60-65⁰ latitude of both hemisphere the air circulation is called as polar cell.

2. Local wind

Wind generated due to local conditions and influence very small area is called as local wind

a) Land and see breeze

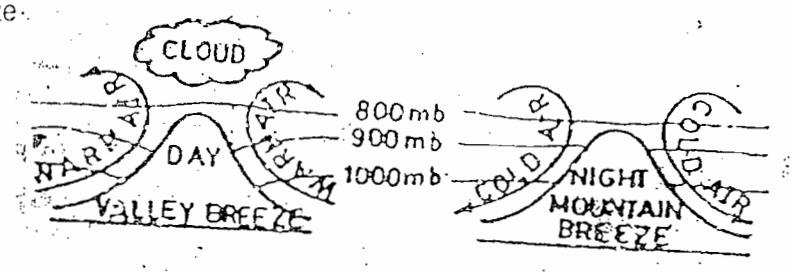
- Inter change of air in between sea and land due to unequal heating and cooling is called as land see breezes.
- During day time coastal land heated faster than sea water caring low pressure over the land.
- Surface air blows from sea to land is known as sea breezes
- During night land cool faster than sea water causing high pressure over land than sea water. Therefore air blows from land to sea is called land breezes.



Land Sea Breeze

b) Mountain and valley breeze

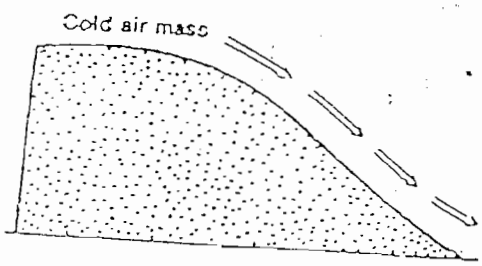
- Interchange of air between mountain and valley due to unequal heating and cooling two places called mountain and valley breezes.
- During day time valley floor become heated due to raising of air sides up the mountain slope is called as valley breeze.
- During night reverse process take place.
- The air on the mountain slope in cool and sides down to the valley which is known on mountain breeze.



Mountain and Valley Breeze

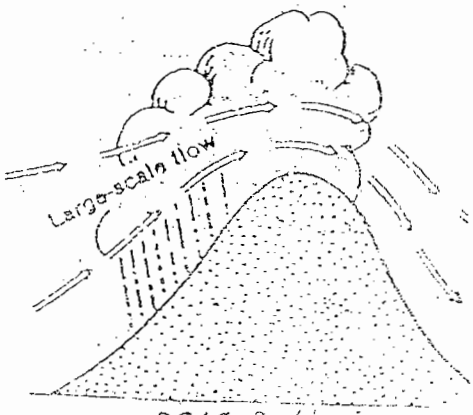
c) Ketabatic wind

- Mass of cold air over a place during winter it become dence and drain down the slope into valley resulting down slope drainage type wind are called as ketabatic wind.
- Speed of wind is not more than 4-5 M/s
- It disturbs due to cyclone only



d) Foehn winds

- Down flow of air that occurs in many mountain area but it is not caused by drainage of dense air
- It occurs when prevailing wind in warm and directed against the mountain
- At top of mountain air absorbed latent heat at 5°C/km rate. So that it is cool.
- At bottom of mountain air in warmer at 10°C/km so that it is warmer
- The air which blow from bottom of mountain to top of mountain and then top of mountain to bottom of valley called as foehn wind



3. Mansoon wind

- Interchange of air between the land and ocean due to unequal heating and cooling of continent and ocean is called as monsoon wind.
- Indian monsoon divided in to two categories 1) South-west Monsoon and 2) North-East Monsoon

a) South west monsoon

- India positionally situated in north-east trade winds and have N-E wind through out year. Create low pressure in upper India due to which S-W wind is dominants.
- During April to September low pressure center is created over N-W India
- This monsoon blows from africal coast 15°E

b) Nort-East Monsoon

- High pressure center is located in eastern Asia (1035 mb) and low in about 1010 mb
- During this time from North to South cold season is established.
- This will active during October to November.
- This wind are dry and blow N-E direction and give rainfall to Andhra Pradesh, Tamilnadu state of india.

Q. Explain in details factors affecting production of wind

Ans : FACTORS AFFECTING PRODUCTION OF WIND

1. Horizontal pressure gradient force

- Rate of change of atmospheric pressure of two points of same elevation called pressure gradient or isoboric slope
- Direction of air flow is from higher pressure to lower pressure speed of flow is directly related to pressure gradient
- Direction of pressure gradient in perpendicular to isobar

$$PG = \frac{1}{P} \times \frac{dp}{dn}$$

Where, P = Density of air

dp/dn = Rate of change of pressure with distance

2) Earth rotational deflection force or coriolis force

- The force created due to rotation of earth on its axis Called as Coriolis Fource.
- It influence the wind direction
- This force causes all winds in north hemisphere to move right and in south hemisphere to move in left direction with respect to rotating earth.
- At equators effect has zero value towards poles it increases (Sin 9 = 1)
- This coriolis force change the direction of wind but not change speed of wind

3) Centrifuged force

- This force throw the soil particles outwards from center of small circles on which particle move.
- Centrifugal force worked against gravitational force

4) Frictional force

- Roughness of surface provide frictional resistance to air motion.
- Tree buildings and irregular topography apposed direction of air motion 30 speed of air decreases.

5) Geostropic wind

- Wind flow in a straight line with no acceleration or friction forces on it only forces actively are coriolis and pressure gradients force.
- Wind below under this condition called on geostropic wind

Q. Give short note on cyclone and anticyclone

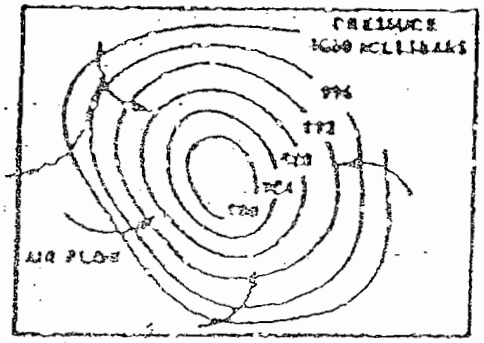
Ans :

Cyclone

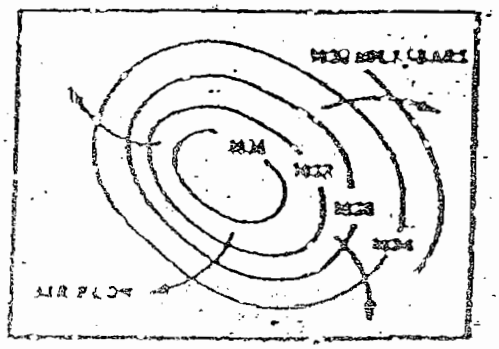
- Atmospheric disturbance in which air pressure decreases at center and there is wind movement at center
- A system of close isobar with low pressure at center called cyclone
- In north hemisphere direction of rotation of cyclone in anticlock wise
- It south hemisphere direction of rotation of cyclone is cock wise
- Cyclone are also known as laws or pression
- The velocity of wind in cyclone is most than 34 knots

Anticyclone

- There is area of high pressure at center and flow of air start from center to outer side
- A system of closed isobar with high pressure at center is called as anticyclone
- Direction of rotation of anticyclone in north hemisphere in clock wise and in south hemisphere in anti clock wise
- It is also known as high.



cyclone



Anticyclone

Q. Define Condensation and sublimation and explain conditions for condensation and forms of condensation

Ans :-

Condensation :-

It is process in which water vapours are converted in to liquids

Sublimation

It is process in which water vapours are converted into solid form or vice versa called sublimation

CONDITIONS FOR CONDENSATION

1) Presence of sufficient water vapours

- Sufficient amount of water vapours are necessary to bring about saturation of air.
- Air can easily brought to saturation when sufficient moisture in present.

2) Presence of condensation nuclei

- Microscopic particles having size 0.1 to 1 micron i.e. salt, sulfuric oxide and nitric acids are present in atmosphere and have hygro scopic nature.
- On this particles water vapours can only deposited and condense.
- Microscopic and hygroscopic particles around which condensation beings are called condensation nuclei
- In absence of condensation nuclei condensation can not start if the air is fully saturated with more than 100 % RH.
- Concentration of condensation nuclei in atmosphere is 10 to 100/cm^3

3) Cooling of air

- For saturation of atmosphere air with water vapours its cooling upto and below dew point temperature is necessary.
- Cooling is take place by adiabatic and non adiabatic process.

FORMS OF CONDENSATION

1) Dew

- Deposition of water vapours in forms of tiny droplets on colder bodies by condensation called dew.

2) Frost

- When temperature of air falls below 0^0C, water vapours directly converted into crystals of ice this is called frost.
- It is also called forms of sublimation.
- Frost in injurious to vegetation.

3) Fog

- It is extremely small water droplets suspended in atmosphere and reducing horizontal visibility called fog.

Conditions for formation of fog

- Air should not very dry
- Ground should not heated during day time
- Velocity of wind less than 3mph

Classification of fog

- **Thick fog** – Restricts visibility (45 m)
- **Moderate** – 450 m visibility restriction
- **Thin fog** – 900 meters

4) Mist

- Less dense fog called mist
- Suspended water vapour droplets restrict visibility between 1000 to 2000 meters and RH is 75%

5) Rime

- When wet fog having super cold droplets immediately freeze on striking object having temperature below freezing points.
- White ice is formed on wind ward side.

6) Smog

- Combined effect of smoke and fog droplets may reduce visibility
- This phenomena is called as smog

7) Haze

- Some solid particles i.e. dust, smoke and industry restrict visibility called haze.

Q. Define participation and explain in details forms of participation

Ans :-

Participation :

Earth ward falling of water drops or ice particles that have formed by rapid condensation in atmosphere and are too large to remain suspended in atmosphere is called participation

FORMS OF PARTICIPATION

I) Liquid forms

a) Rain
b) Drizzle
c) Shower

II) Solid forms

a) Snow
b) Hails

III) Mixed form

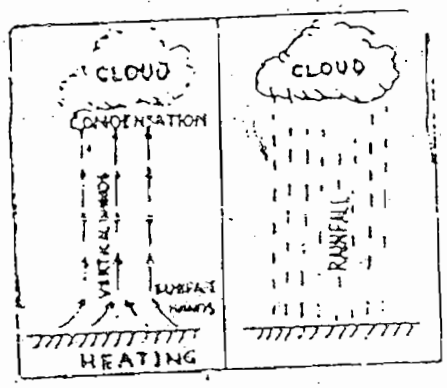
a) Sleet
b) Hail storms

a) Rains

- It is participation of droplet of liquid water
- Clouds consist minute droplets having size 0.02 mm diameter
- These droplets combines together and form big droplets
- Due to large size they do not remain suspended in air and they falls down as rain.
- Droplets formed by rapid condensation
- Raindrop have size **0.05 to 0.06 cm** or 0.5 to 0.6 mm.
- Line joining the place of same rainfall called as isohyte

Types of rains

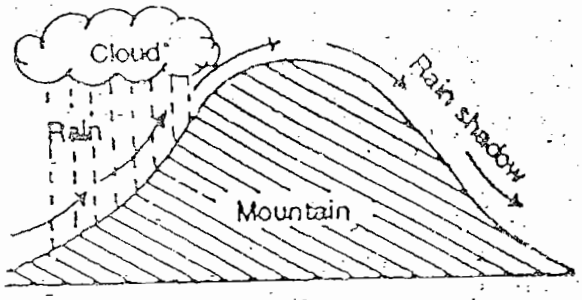
1. Convectional rains



Conventional precipitation

- Due to heating, the air near to ground become hot and move upward direction called convection.
- The move upward direction it cools at 9 . 8°C/km and become saturated dew point reaches and condensation start.
- This point is called as condensation level.
- Above this condensation level air cool at 5°C/km and clouds are formed.
- Then further condensation resulted into precipitation.
- This rain is called as convectional rain.

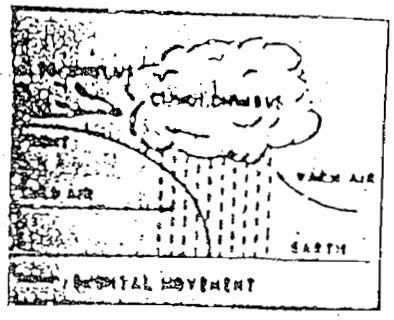
2. . Orographic or relief rain



Orographic precipitation

- Moist air coming form sea encounters mountain it can not move horizontally and has to over come mountains.
- When this air goes upwards, it cool down, clouds forms and condensation starts and give the precipitation.
- This rain is known as orographic rain.
- Thus high rain are possible on wind ward side and low rain are possible in leeward region called rain shadow region.

3. **Frontal cyclonic and convergent rain**



- Frontal precipitation is produced when two apposing air currents with different temperature are meet.
- Vertical lifting take place and it give rise condensation and precipitation.
- Humid and warm air mass meet to cold mass. This cold mass replace the warm mask.
- Boundary zone at two air masses meet called front
- When this warm and moist air mass meet to cold air mass temperature of warm air reduces saturation occurs and it give precipitation.
- Rains received from cyclones called cyclonic rain.

b) Drizzles

- More or less uniform precipitation of very small and numerous drops which are carried away by light wind called Drizzle.
- Size of rain drops are less than 0.5 mm.
- Precipitation is less than 1mm/hr.

c) Shower

- Precipitation lasting for a short time with relatively clear interval called shower.

II) Solid forms

a) Snow

- Precipitation of water in the solid form of small or large ice crystal called as snow.
- It occurs when condensation medium below the freezing temperature.

- It measured by snow gauges.

b) Hails

- It is precipitation of solid ice.
- During warm sun day a strong connective column may cause formation of pellels having special shapes and such formation is called as hails.
- Hail stones may large size is cricket ball size.

III) Mixed forms

a) Sleet

- Simultaneous precipitation of mixture of rain and snow called sleet.

b) Hailstorm

- Rainfall with hail stones called hail storms

Q. Short notes on

I) Mechanisms of precipitation

1) Bergeron mechanism

- Cloud having very cold temperature is cold cloud.
- These cloud ice particles are formed due to low temperature i.e. 15°C to –25°C developing hexagonal shaped crystals.
- These Ice crystals on collision form snow pellets.
- Then it melt into water droplets when it falls on grounds through warm atmosphere.
- Artificial rain making is based on this mechanism

2) Collission and coalescence

- Cloud having slight temperature is hot cloud
- In this cloud fine water droplets forms.
- These fine water droplets colloids and combines and grow into large size and finally falls on earths as rain.

II) Thunder storm

- It is atmosphere disturbance which accompanied by thunder, lightening and by hails.
- It is local storm covering small area and causing damages.
- Cumulo-nimbus clouds form the copious precipitation. Due to this decrease temperature form destructive wind.
- Thunder storm occurs in different parts of worlds and their frequency decreases with increase in latitude

Types of storms

1. Frontal or general thunder storm

- Occurs over wide area with passing of cyclonic disturbance.

2) Local thunder storms

- It resulted from local convection

Q. Define clouds and explain in details types and classification of clouds

Ans :-

Cloud :-

Mass of tiny water droplets or ice crystals or both condensed on hygroscopic nuclei and suspended in the atmosphere

Isoneph :-

Line joining place of equal cloud cover on a map called isoneph

- Cloud or fogs are composed of water droplets or ice crystals having size 20-60 micron or 0.008 – 0.024 milimeter

Types of clouds

I) Cirrus (Ci) :-

- Meaning of cirrus is curls / recognised by its veil like fibers
- Form of this cloud is fibrous or feathery
- It is highest type of cloud
- Generally observed at 7-12 km altitude i.e. 20000-35000 ft.

II) Culumus (Cu)

- Meaning is heap
- It is wooly, bunchy cloud with rounded top and flat base
- Commonly observed in summer season.
- It is result of convection
- Highest of this cloud is variable it depends upon relative humidity of air

1. cirrus
2. culumus
3. stratus
4. Nimbus

III) Stratus (St)

- It is sheet type cloud without any form of different
- Generally observed below cumulus

IV) Nimbus (Nb)

- It is any dark and ragged cloud
- From this cloud precipitation is occurs

CLASSIFICATION OF CLOUDS

- Classification of cloud as per height and appearance is given world meteorological organization (WMO)

I). Family A (height – 7-12 km)High clouds

1. Cirrus (Cl)

- Height of cloud - 7 to 12 km
- Composition of cloud – ice crystals
- Weather change -- Storm and showery weather

Characteristics

- Does not produce precipitation

- Whispy and feathery
- Sunshine without shadow

2) Cirrocomulus (CC)

- Height of cloud - 7 to 12 km
- Composition – Ice crystal
- Possibility – storm
- Look like rippled sand
- Meekerel sky
- Open for runner of cyclone

3) Cirrostratus (CS)

- Composition – ice crystal
- Possibility – Storms
- Whitish veil and produce hales
- Height of cloud - 7 to 12 km

family A 7 to 12 km
Cirrus
cirrocumulus
Cirrostratus

II) Family B : height 3-7 km (Medium cloud)

family B 3-7 km
Altocumulus
Altostratus

1) Altocumulus (AC)

- Composition – Ice and water
- Possibility – Rain or snow
- Look like wool peak and sheep bulk clouds
- Height 3-7 Km

2) Attrostratus (AS)

- Composition : Ice and water
- Possibility : Impending rain and snow
- Look like : Fibrous sheet
- Colour : Blue or bluish
- cast shadow
- Height 3-7 Km

family C 3 km
Stratocumulus
stratus
Nimbostratus

III) Family C : Height – 3 km (Low cloud)

family - D 0.5 – 16 km
Cumulus
Cumulonimbus

1) Stratocumulus (SC)

- Composition – Water
- Possibility – Rainfall
- Height – 3 km

Characters

- Long parellel roll
- Broken masses with gray colour having some darker part
- Air is smooth

2) Stratus (St)

- Composition : Water
- Possbility : Produce drizzles
- Height – 3 km

Characters

- Chief winter cloud
- Low uniform layer
- Resembling frog

A – 7 – 12 km
B 3 – 7 km
C 3 – km
D 0.5 – 16 km.

3) Nimbostratus

- Composition : Water ice crystals
- Possibility – continues snow or rainfall
- Height – 3 km

Characters

- Uniform layer
- Dark gray in colour
- Chief precipitations

IV) Family D : Height – 0.5 to 16 km

1. Cumulus (CU)

- Composition :- Water
- Possibility : Fair weather

Characters

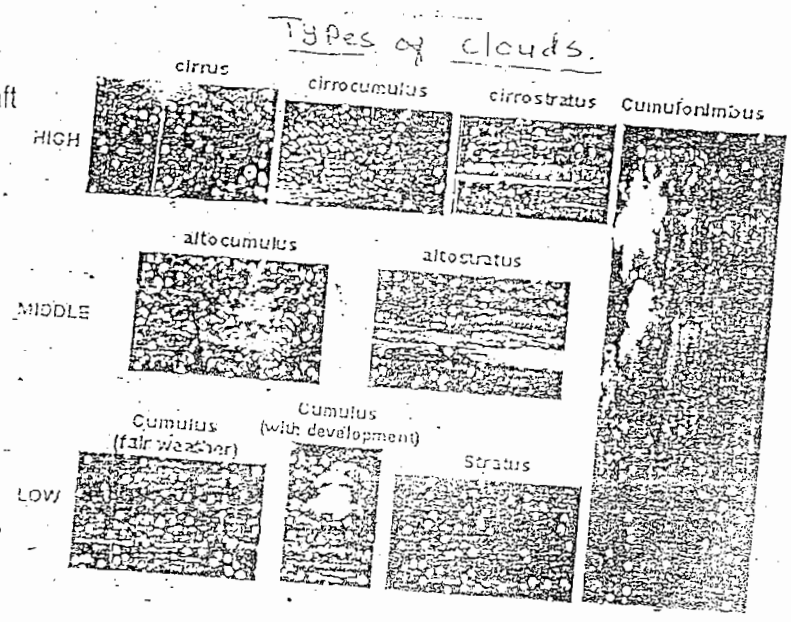
- Look like wool pack
- Dark below due to shadow
- Develop into comsulo nimbus base

2) Cumulonimbus (Cb)

- Composition : Water in lower level ice crystal in upper level.
- Possibility : wind rain, thunder storm, lightening

Character :

- Chief precipitation
- Violet up and down draft
- Thunder head



Q. Define evaporation and explain factors affecting evaporation

Ans :-

Evaporation :

It is process in which water is converted into its vapours

OR

Water is converted into vapours by getting sun heat energy from soil surface called evaporation

FACTORS AFFECTING EVAPORATION

1. Soil and air temperature
2. Velocity of wind
3. Degree of wetness of surface
4. Atmospheric humidity
5. Vegetative cover of surface
6. Mulches
7. Depth of soil
8. Composition of water
9. Concentration of water between surface and surrounding air

Q. Define transpiration and explain in details factors affecting transpiration ?

Ans :

Transpiration :

It is physiological process through which water vapours escaped through leaf stomata and some time through cuticles

OR

Loss of water from plant body by getting heat energy or by physiological process called transpiration

FACTORS AFFECTING TRANSPIRATION

1. Water vapour pressures
2. Concentration of gradient into atmosphere
3. Light intensity
4. Atmospheric vapour pressure
5. Temperature
6. Wind Soil factors
7. Supply of energy
8. Efficiency of plant root to absorb water
9. Leaf area
10. Leaf structure
11. Stomatal behaviour
12. Leaf arrangement

Q. Define Evapotranspiration (ET), consumptive use (CO), Actual Evapotranspiration (AET), potential evapotranspiration (PET) and explain in details factors affecting Evapotranspirations (ET)

Ans :

Evapotranspiration :

Loss of water by transpiration from plant body and by evaporation from soil surface called evapotranspiration

Consumptive use

Loss of water through evapotranspiration and which is used by plant for its metabolic process i.e. less than 1 % is called consumptive use

Actual Evapotranspiration

Amount of soil water loss by evapotranspiration for a given soil moisture under the prevailing weather

Potential Evapo - transpiration

Amount of soil water loss by evapotranspiration From large vegetation area where water supply is at maximum level

FACTORS AFFECTING EVAPOTRANSPIRATION

I) Soil factors

1) Availability of water

- If water availability is more than evapotranspiration will proceed at maximum level depending on rate of energy available.
- If soil water availability is less then evapotranspiration also decreases.

2) Evaporation

- Evaporation at first stage of drying in high (after irrigation)
- After 4-5 days of irrigation evaporation is less

3) Soil water to plant

- Soil evaporation is decreases when plant cover is more
- Evapotranspiration depends on soil water status and availability of root which extract the available water.
- If soil water is less then transpiration is also less.

4) Dew and intercepted water

- Dew reduce the rate of evapotranspiration and intercepted water increase the rate of evapotranspiration.

Agroclimatic zones of Maharashtra

Zones	VRI	VRN	GH	TR – I	TR – II	SC	AR	MR	HRM
Regions	South raigadh,ratanagiri, sindudurg	Thane Raigadh	West kolapur ,satara, sangli ,pune nashik	Western ghat of nashik ,pune kolapur	West dhule ,sangli ,pune	Beed solapur, osmanabad	Beed parbhani nanded, latur ,aurangabad	Wardha ,nagpur yeowatmal	Chandrapur,gadchiroli
Climate	Rainfall-3100 mm Temp 22-31 degree c	Rainfall-3100 mm	Rainfall-5000mm	Rainfall-1750 to 2500 mm	Rainfall-950-1250 mm	Rainfall-750 mm	Rainfall-750-900 mm	Rainfall-950-1250 mm	Rainfall-1250-1700 mm
Topography	Altitude-30 m	Altitude-30 m	Altitude-600-1000 m	Altitude-500-1000 m	Altitude-300-1000 m	Altitude-600 m	Altitude-600 m	Altitude-600 m	Altitude-600 m
Soil	Lateratic soil	Non lateratic soil	Light brown to dark brown	Red brown to black soil	Brown to dark brown	Brown to black	Black calcarious	Medium black to deep black	Yellow brown to red
Crops	Paddy,wari,sawa	Paddy pulse banana	Hill millets paddy niger	Pulse sorghum groundnut	Groundnut sorghum bajra pulse	Sorghum sugarcane cotton wheat	Sorghum pulse oilseed	Red gram, paddy, wheat	Pulse, paddy
Vegetation	Deciduous forest	Deciduous forest	Semi-Deciduous	Deciduous forest	Dry Deciduous forest	Sporadic deciduous forest	Dry Deciduous	Deciduous forest	Deciduous forest

Q. Define drought and explain in detail classification of drought

Ans :-

Drought :

Period of no rainfall over extended time creating soil moisture deficient and hydrological imbalance.

Drought resistance :

Relative ability of plant to maintain growth and yield under moisture stress condition.

Classification of drought

A) On the basis of water available

1. Meteorological drought
2. Hydrological drought
3. Agricultural drought

B) On the basis of time of occurrence

1. Permanent drought
2. Seasonal drought
3. Contingent drought
4. Invisible drought

C) On the basis of medium in which drought occurs

1. Atmospheric drought
2. Soil drought
3. Socio-economic drought

A) On the basis of water available

1. Meteorological drought : slight, moderate, severe

Situation where actual rainfall fall short below certain level (75%) of normal rainfall over the area is called meteorological drought.

2. Hydrological drought

Situation on deficit rainfall when the hydrological source like streams, rivers, lakes well etc. dry up and water table deplete/decrease.

3. Agricultural drought

Situation resulting from inadequate rainfall when soil moisture falls short to meet demand of water of crop during crop growth.

B) On the basis of occurrence

1. Permanent drought :

This is observed in the area which are permanently dry arid and desert where crop production is not possible without irrigation.

2. Seasonal drought :

It is resulted due to large scale seasonal circulation of wet and dry climate.

It is resulting due to aberrant weather conditions like late onset, dry spell, during monsoon, early withdrawal of monsoon etc and irregular and variable nature of rainfall.

4. Invisible drought :

It is occurs at any time and is basically related to its failure to fulfill the crop needs of water.

C) On the basis of medium in which drought occurs

1. Soil drought :

The condition in which soil moisture deplet and fails to meet PET need of the crop.

2. Atmospheric drought :

Resulted from low humidity, dry and hot wind and causes desiccation of plant.

3. Socio-economic drought :

It is associated with the demand and supply of economic good.

Q. Define drought explain measures to overcome drought

Ans :

Drought :

Period of no rainfall over extended time creating soil moisture deficient and hydrological imbalance.

MEASURES TO OVERCOME DROUGHT

1. Recycling of excess run off by creating storage structure.
2. Deep tillage to absorb and hold moisture in root zone.
3. Timely weed management to reduce evaporation.
4. Inter basin transfer of surface water from surplus water area to drought prone area.
5. Planning for suitable planning system.
6. Selection of short duration crop.
7. Development of ground water table.
8. Development of water harvesting practices.
9. Soil moisture conservation practice like mulching and use of anti-transparent.
10. Minimize evaporation losses from water body.

Q. Define weather forecasting Agriculture weather forecast and explain in details classification and importance of weather forecasting

Ans :

Weather forecast :

Any advance information about the probable weather in future which is obtained by evaluating the present and past meteorological condition of the atmosphere is called weather forecast.

Agriculture weather forecast :

Forecasting of weather element which are important in agriculture and for forming operation is called agriculture weather forecast.

CLASSIFICATION OF WEATHER FORECASTING

1. Now casting :
   - It is based on synoptic situation prevailing at the time of forecasting.
   - It valid upto 6 to 24 hour.
   - It issued twice a day.
2. Short range forecast :
   - It is based on synoptic situation prevailing at the time of forecasting
   - Valid up to 3 days or 72 hours
   - Issued twice in a day.
3. Medium range forecast :
   - Forecasting of meteorological elements over different agroclimatic zones for period of 3 to 10 days called medium range forecast.
4. Large range forecast :
   - Forecast valid for more than 10 days called large range forecast.

IMPORTANCE OF WEATHER FORECASTING IN AGRICULTURE

1. Helps in storage of food grain.
2. Helps in transportation of food grains.
3. Helps in measures to protect livestock.
4. Helps in management of cultural operations like ploughing, harrowing, hoeings etc.
5. Helps for suitable planning of farm.
6. Helps to perform sowing operation before rainfall
7. Helps to perform farm operations
   - Fertilizer application.
   - Irrigate crop or not.
   - When to start harvesting of crop.

Short note on
Crop modeling

- It utilizes the past and the present weather data and crop data to predict the crop performance in the future.
- These forecasts may be about the occurrence of some phonological events viz. emergence, flowering, fruiting, maturity and harvesting etc. or may be about the possible crop production.
- The impact of weather and climate on crop growth and yield can be represented by crop weather models.
- A model in general is an equation or set of equations which represent the behaviour of a system.

1. **Statistical empirical model**
   Actual mechanism of processes is not disclosed.
2. **Mechanistic model**
   Mechanism of the processes involved is discussed e.g. photosynthesis based model.
3. **Static model**
   Time is not a factor
4. **Dynamic model**
   These models predict changes in crop status with time.
5. **Deterministic model**
   In which a definite outputs is given e.g. NPK doses are applied and the definite yields are given out.
6. **Stochastic model**
   The models are based on the probability of occurrence of some external event for external variable. Probabilities are given out.

The statistical techniques used in designing the models are as follows :

1. Simple regression analysis
2. Simple correlation technique
3. Curvilinear correlations techniques
4. Multiple regression analysis
5. Stepwise regression analysis.
6. Fishers orthogonal polynomial techniques. Mallow's Cp techniques
7. Markov chain model.

Bair (1979) classify crop weather model as follows

1. Crop growth stimulation models
2. Crop weather analysis models
3. Empirical statistical models

DEFINITIONS

1. **Absolute humidity :** It is ratio of actual mass of water vapour present to the total volume of moist air in which it is contained.
2. **Albedo :** Ratio of radiation reflected to radiation received.
3. **Aerosol :** Different solid particles some liquid particles which remain suspended in atmosphere these particles are dispersed in atmosphere and known as aerosol.
4. **Altitude :** It is the vertical height above mean sea level.
5. **Atmosphere :** It is the gaseous envelope surrounding earth surface.
6. **Atmospheric pressure :** Force exerted by atmospheric air in unit area of the earth surface.
7. **Climate :** It is generalized statement of variety of day weather condition. It is for a longer period of time and for large area as season and region.
8. **Clouds :** It is result of the condensation of the atmospheric water vapour in the form of tiny water drops by cooling at greater height from ground OR cloud can be defined as mass of tiny droplets condensed on large scale and suspended in atmosphere at higher altitude.
9. **Cyclones :** It is the atmospheric disturbance in which the air pressure decrease at a particle location and there is a wind movement towards centers. A system of closed isobars with the lowest pressure at the center is called as cyclone.
10. **Dew point temperature** : it is the temperature at which water vapour condenses and converts into water droplets.
11. **Drought** : It is period inadequate or no rainfall over extended time creating soil moisture deflict and hydrological imbalance.
12. **Dry adiabatic lapse rate (DALR)** : When a parcel of dry air is displaced upwards, there is a fall in temperature of the parcol by adiabatic process. And it is found that the rate of fall of temperature with height is 9.8°C/km or 5.5/1000 ft. and it is known as dry adiabatic lapse rate.
13. **Equinoxes** : The equator has two insolation maxima at the solstices to the apparent passage of sun during its double annual movement between northern and southern hemispheres. The winter equinox is the September while summer is in March.
14. **Evaporation** : It is the process by which liquid or solid state is transformed to gasses or vapour state.
15. **Evapotranspiration** : The loss of water by evaporation from the soil as well as plant and transpiration from plant surfaces.
16. **Green house effect** : The short wave radiation received from sun increase the temperature of the earth surface. After having full saturation the heat is reflected back to atmosphere through long wave radiation. The atmospheric temperature in the troposphere then increased and heat reradiate back to earth. This effect is just like a glass house, therefore, it is known as green house effect.

17. **Isobar** : the lines connecting places having the same atmospheric pressure at a given elevation.
18. **Isohel** : It is the line on the weather map joining the places of equal sunshine.
19. **Isohyet** : it is the line on the weather map joining the places of equal rainfall or precipitation.
20. **Isotach** : It is the line on the weather map joining the places of equal wind speed.
21. **Isotherm** : It is the line on the weather map joining the places of equal temperature.
22. **Isotherms** : It is the temperature, that remains constant with elevation.
23. **Isothermal process** : When the air parcels undergoes displacement at a constant temperature the process is said to be isothermal processes. In such process, the air parcel gains heat/losses heat from the surrounding air maintaining its temperature constant.
24. **Lapse rate** : It is the rate of decrease in temperature with rise in height from the ground surface. It is also called as positive vertical temperature gradient or vertical cooling rate of air. The average lapse rate in the lower 10 km of the atmosphere is about 6.5°C/km or 3.6°F/1000 ft.
25. **Latent heat** : it is amount of heat released or absorbed per unit mass by a system during change of phase.
26. **Latitude** : It is horizontal angular distance hence in degrees measured from the equator towards the poles (South and North pole)
27. **Leeward** : it is the direction towards which wind blows
28. **Net radiation** : It is the difference between total incoming radiation (Short wave and long wave) and total outgoing radiation (Short wave and long wave).
29. **Potential evapotranspiration** : It can be defined as the amount of water transpired in unit volume by a short green grass of uniform height crop – completely covering and shading the ground and never short of water.
30. **Precipitation** : It denotes the earthward falling of water drops of ice brickets/ crystals that are formed due to rapid condensation in the atmosphere.
31. **Pressure gradient** : it is the rate of change of pressure at two points of same elevation.
32. **Radiation** : it is a form of energy emitted by all objects having temperature above absolute zero OR it is the heat given out of the sun directly.
33. **Rainy day** : It is a day on which rainfall received is more than 2.5 mm.
34. **Saturated adiabatic lapse rate (SALR)** : When the parcel of saturated air is displaced upward its temperature also decrease by adiabatic process. The average value of decrease in temperature through out the atmosphere is 5.0°C/km or about 3.0°F/1000 ft. and this is known as SALR.
35. **Solar constant** : It is the energy received at the top of atmosphere held perpendicular at mean distance it is 1.94 cal/cm²/min generally referred as 2.0 cal/cm²/min.

36. **Solstics :** The polar region receive maximum amount of insolation during their summer solstices which is the period of continous day. The amount of insolation received during December sclastices in the southern hemisphere is greater than that received in northern hemisphere during June solstice due to elliptical path of earth round the sun.
37. **Temperature :** It is measure of degree of hotness.
38. **Temperature gradient :** The rate of changes of temperature with distance is known as temperature gradient.
39. **Temperature inversion :** If temperature is increases with increase in height called temperature inversion.
40. **Terrestrial radiation :** The sunrays are firstly absorbed by the earth surface then temperature of earth is increased which are reemitted to atmosphere then the atmosphere is warmed up by the heat of longwave radiation from the earth's surface which is known as terrestrial radiation.
41. **Trade winds :** These are the winds blow from tropics towards equator.
42. **Weather :** Weather can be defined as a physical condition or state of the atmosphere at particular time and place.
43. **Wind :** Air that moves parallel to any part of the earth's surface is referred to as wind the flow of air is horizontal OR the horizontal flow of air is called as wind.

FILL IN THE BLANKS

1. The direction of wind towards which wind blows is called as leeward
2. Longwave radiations are absorbed by carbon dioxide and water vapour in the atmosphere.
3. The life on the earth is protected from harmful radiation by ozone in the atmosphere.
4. The direction of rotation cyclone in southern hemisphere is clockwise.
5. The capacity of atmosphere to hold moisture increase with increase in temperature.
6. Ultraviolet radiation is absorbed by ozone in atmosphere
7. One bar is equal to 10^6 dynes/cm^2
8. The fraction of total incident radiation which reflected back is known as albedo
9. The moisture present in the air is measured by the instrument known as hygrometer.
10. The average (static) lapse rate of temperature is 6.2^{0}C/km or 3.6^{0}F/1000 feet.
11. Nitrogen and Oxygen are the major constituents in the composition of atmosphere.
12. When the temperature increases with increase in height, the condition is known as inversion
13. The stratosphere contain much of the total atmosphere ozone and the density of ozone is maximum at 22 km to 25 km.
14. Air pressure is measured by instrument called Barometer
15. Aneroid barometer is frequently used as weather forecaster
16. The system of close isobars with the lowest pressure at the center is called as cyclones.

hemisphere.

18. The India meteorological department has divided the climatic year into four seasons
19. Cirrus clouds are termed as high clouds.
20. When the rainfall ≤ 50 per cent of the normal rainfall it is called as severe drought.
21. Cumulonimbus clouds produce continuous precipitation/rainfall.
22. Ozone absorbs ultra-violet radiations.
23. The maximum proportion of water vapour in the atmosphere is 4 per cent
24. Minimum thermometer is calibrated from –40 to + 50°c
25. For designing direction of wind, wind vane is used.
26. One knot = Kmph x 0.54
27. Head office of IMD is situated at Pune .
28. Windward is the direction from which wind is approaching to the station.
29. Robinson's cup anemometer measures velocity or speed of wind
30. A diameter of open pan evaporimeter is 120 cm
31. The door of stevenson's screen should be always faced towards North
32. Lysimeter is used for measuring evapotranspiration
33. Beaufort scale is referred in measuring the velocity of wind
34. the cloud is described in octa and that is ranged between 0 to 9.
35. Pyranometer or solarimeter works on thermoelectric principles
36. Soil thermometers should always face towards south
37. When the scale of height is given on aneroid barometer for the measurement, it is termed as altimeter
38. Remote sensing with radar is active microwave techniques.