Key Terms to remember

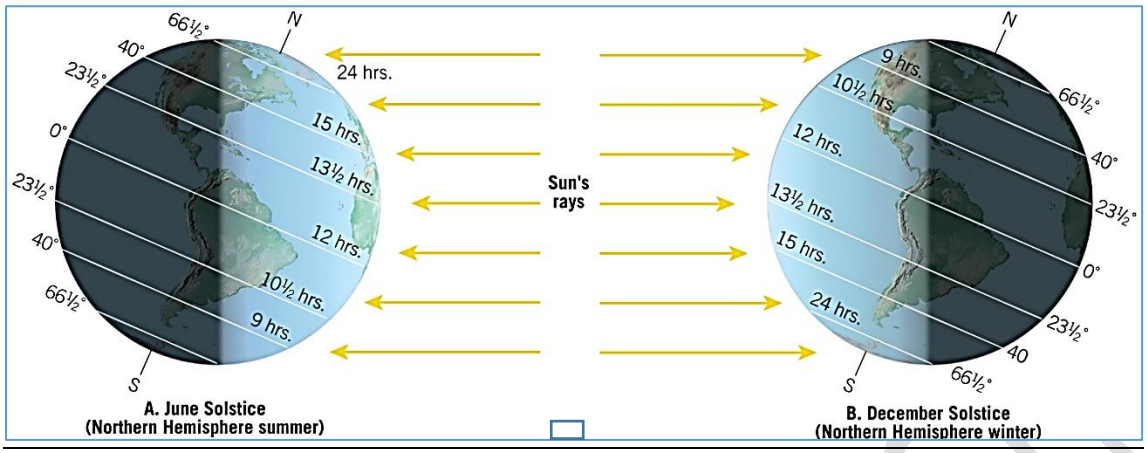
- Insolation: The incoming solar radiation that is received on a specified area over a set period of time is called insolation. It is expressed in watts per square meter (W/m2).
- During its revolution around the sun, the earth is farthest from the sun (152 million km) on 4th July. This position of the earth is called aphelion. Therefore, the annual insolation received by the earth on 3rd January is slightly more than the amount received on 4th July.
- On 3rd January, the earth is the nearest to the sun (147 million km). This position is called perihelion. Therefore, the annual insolation received by the earth on 4th July is slightly less than the amount received on 3rd January.
- Terrestrial radiation: The earth after being heated by insolation itself radiates energy to the atmosphere in long wave form. This long wave energy is known as terrestrial radiation.
- Heat Budget of the earth: The net flow of incoming solar radiation and outgoing terrestrial radiation is Earth's energy budget. For Earth's temperature to be stable over long periods of time, incoming energy and outgoing energy have to be equal.
- Insolation while passing through the atmosphere is reflected back to space even before reaching the earth's surface. The reflected amount of radiation is called the albedo of the earth.
- The Isotherms are lines joining places having equal temperature.
- The rate of decrease of temperature with height is termed as the normal lapse rate. It is 6.5°C per 1,000 m.
- Inversion of temperature occurs during long winter night with clear skies and still air. The heat of the day is released during the night, and by early morning hours, the air over land is cooler than warm air above. Dense fogs in mornings occurs in winters and in mountains cold air fills up valleys are examples of it.

Why the variation in the solar output received on the top of atmosphere does not affect daily weather conditions on the surface of the earth?

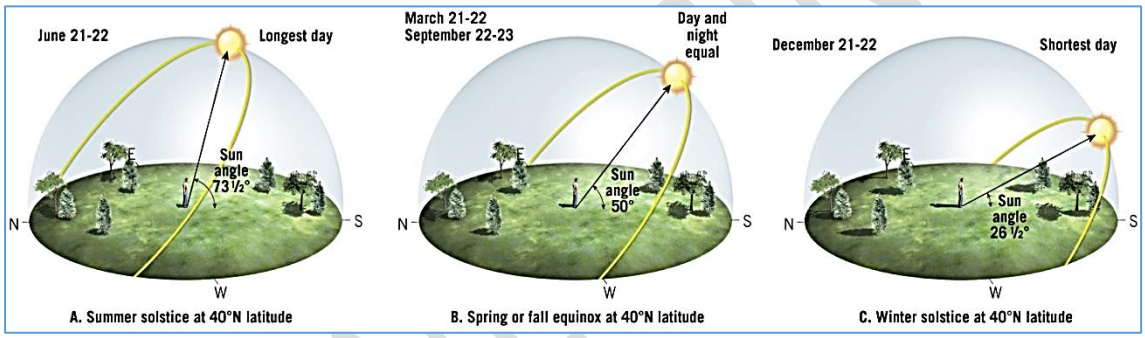
- At the top of atmosphere, the solar output received by the earth on 3rd January is slightly more than the amount received on 4th July.
- The effect of this variation in the solar output is masked by other factors like the distribution of land and sea and the atmospheric circulation.
- Hence, this variation in the solar output does not have great effect on daily weather changes on the surface of the earth.

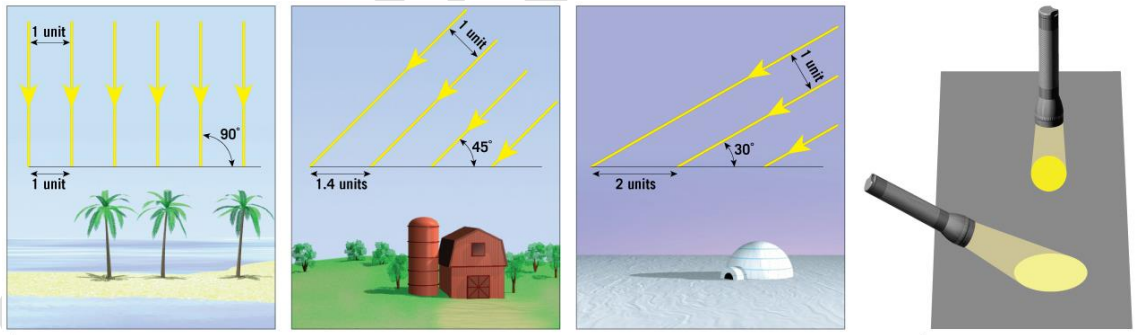
Factors that help determine how much insolation actually reaches a given area.

- -The rotation of earth on its axis: Earth's axial tilt is 23.45º which has a greater influence on the amount of insolation received at different latitudes.



- -The angle of inclination of the sun's rays (Solar Declination): This depends on the latitude of a place. The higher the latitude the less is the angle resulting in slant sun rays. The energy gets distributed, scattered and the net energy received per unit area decreases.





- -The length of the day (Photoperiod): Duration of the day varies from place to place and season to season. The longer the duration of the day, the greater is the amount of insolation received. During summers the day length is high thus temperatures are more.
- -Atmospheric Conditions (Clouds, smoke, pollution, diffuse sky light): When the solar radiation passes through the atmosphere within the troposphere water vapour, ozone and dust particles absorb or scatter much of it.
- -The configuration of land in terms of its aspect: Maximum insolation is received over the subtropical deserts, during summers and over continents. Equator, during winters and over

oceans it is comparatively less. That is because the cloudiness is the least at tropical areas and over continents.

Different ways of heating and cooling of the atmosphere.

- Conduction: The surface after being heated by insolation transmits the heat to the air in contact with it. The upper layers in contact with the lower layers also get heated. This process is called conduction.
- Convection: When the air is heated it rises upwards. The process of vertical heating of the air in the form of currents is known as convection. The convective transfer of energy is confined only to the troposphere.
- Advection: The transfer of heat through horizontal movement of air is called advection. It is relatively more important than the convection. In northern India during summer season local winds called 'loo' is the outcome of advection process.

Factors Controlling Temperature Distribution

The temperature of air at any place is influenced by

(i) the latitude of the place; the insolation varies according to the latitude hence the temperature also varies accordingly.

(ii) the altitude of the place; The air is heated by surface (terrestrial radiation) therefore, the temperature generally decreases with increasing height.

(iii) distance from the sea; Compared to land, the sea gets heated slowly and loses heat slowly. Land heats up and cools down quickly. Therefore, the places situated near the sea have moderate temperature while those away have extreme temperature.

(iv) the air-mass circulation, the presence of warm and cold ocean currents; The places, which come under the influence of warm air-masses or warm ocean currents experience higher temperature and the places that come under the influence of cold air-masses or cold ocean currents experience low temperature.

(v) local aspects. Due to advection process warm winds ("loo") or cold winds ("Cold wave") blow over northern India which increase or decrease temperature respectively.