Class-IX

Geography, Chapter-12

A. Answer the following questions briefly:-

1. What is insolation? State its importance.

Ans.1 Insolation is solar radiation received in the Earth's atmosphere or at its surface. Only approximately 51 per cent of this insolation reaches the earth's surface. The rest is absorbed by water vapour, dust and clouds, or is reflected by the Earth's surface and scattered by particles in the air. Insolation affects temperature. The more the insolation, the higher the temperature. Thus understanding insolation (the amount of energy that hits an area) is important in maximizing the output of solar panels which absorb and convert this energy.

2. State the three processes by which the air gets heated. Explain in brief.

Ans.2 There are three main processes by which the Earth's atmosphere is heated:-

i. Convection:-Convection occurs when heat is transferred through a gas or liquid by the hotter material moving into a cooler area. In meteorology, it is the transfer of heat and other atmospheric properties by the movement of masses of air, particularly in an upward direction.

ii. Conduction:-In conduction, heat moves from areas of more heat to areas of less heat by direct contact. Warmer molecules vibrate rapidly and collide with other nearby molecules, transferring their energy.

iii. Radiation:-It is a process by which a body emits radiant energy (energy received from sun in the form of heat). It causes a loss of heat and therefore leads to cooling.

3. State the various factors influencing the temperature of a place.

Ans.3 Factors influencing the temperature of a place are:-

i. Latitude:-Temperatures drop the further an area is from the equator due to the curvature of the earth. In areas closer to the poles, sunlight has a larger area of atmosphere to pass through and the sun is at a lower angle in the sky.

ii. Altitude:-For every 166 meter rise in altitude, the temperature decreases by about 1℃.High-altitude regions, such as mountainous places, experience low temperatures. Earth's surface absorbs heat energy from the Sun.

iii. Distance from the sea:-Oceans heat up and cool down much more slowly than land. This means that coastal locations tend to be cooler in summer and warmer in winter than places inland at the same latitude and altitude.

iv. Winds:-The temperature gradient between places results in differences in air pressure and ultimately, wind. Wind speeds increase with a greater temperature difference. Winds re-distribute energy around the world.

v. Ocean Currents:-Ocean currents act as conveyer belts of warm and cold water, sending heat toward the Polar Regions and helping tropical areas cool off, thus influencing both weather and climate.

vi. Clouds and Rainfall:-When surface water evaporates, the heat required to change liquid water into vapor is absorbed from the surface and carried along with the vapor into the air. When water vapor condenses into a cloud and falls as rain, it releases that heat, known as latent heat, into the air.

vii. Slope of the land:-Slope and aspect affect the moisture and temperature of air and soil. Sun-facing slopes are warmer than those that are not.

viii. Vegetation:-It checks radiation from upper layer of soil. There is a lesser range of temperature variation in forest areas than in deserts. For this reason it is school the forest as compared to open places.

ix. Nature of the Soil:-The more the water soil can retain, the less rapidly it heats or cools. Dark coloured soil absorbs more heat than the light-coloured soil. This gives rise to differences in temperature. The loamy and clayey soils retain water and sandy soils absorb and release heat more quickly.

4. Why does only 51% of the insolation reach the Earth surface?

Ans.4 Only 51% of the insolation reaches the surface of the Earth as out of the remaining 49%, 35% of the insolation is directly reflected back to space by the atmosphere and the rest of the 14% is absorbed by the ozone layer.

5. What is the effect of latitude on temperature?

Ans.5 Places close to the Equator have higher temperature and are warmer / hotter than places away from the equator. This is because the Sun's rays reach the Earth after passing through the layers of the atmosphere. In the low latitude of the Sun's rays are direct and have to travel a lesser extent through the atmosphere. Hence, the heat of these rays is more intense. But in high altitudes, the Sun's rays are slanting and have to pass through a greater extent of atmosphere.

6. What causes the differential heating of land and water?

Ans.6 Solar heating of the Earth's surface is uneven because land heats faster than water, and this causes air to warm, expand and rise over land while it cools and sinks over the cooler water surfaces. This differential heating is passed on to the air above by conduction which causes air expansion and changes in pressure.

7. What is inversion of temperature? Under what conditions does it apply?

Ans.7 The temperature decreases at the rate of about 1℃ per 166 or 6℃ per 1,000 metres of altitude. There are, however some places where certain special conditions in the lower atmosphere produce a reversal of the normal lapse rate so that temperature actually increases with an increase in altitude. This is known as temperature inversion.

It is generally experienced in hollows and valleys on calm clear nights when radiation has caused cooling and cold air has sunk down. At the same time on the mountain slopes the air is warmer. Temperature inversion is normally found in the middle latitude and for this reason fruit growers in these regions prefer gentle slopes to valley bottom for orchard sites.

8. Which zone will have a higher range of temperature? Why?

Ans.8 The tropical zone contains areas that are the hottest places on earth. Most have a wet season and a dry season as opposed to the more typical cold and hot seasons of the temperate zones. This Zone has the highest range of temperature or heat because it reclines between the temperate zone and the equator. That's why it will get the maximum range of heat or temperature.

9. Name the factors that affect the insolation over the Earth's surface.

Ans.9 Factors affect the Insolation over the Earth's surface are:-i. Latitude ii. Altitude iii. Distance from the Sea iv. Ocean currents v. Winds vi. Clouds and rainfall vii. Slope of the land viii. Vegetation ix. Nature of the soil.

10. Why are the slanting rays less effective than the vertical rays in heating the atmosphere?

Ans.10 Vertical rays travel through a shorter distance in the atmosphere and the loss of heat is less. Slanting rays travel a longer distance through the atmosphere where much of its heat is absorbed by clouds, water vapour and dust particles.

11. How do winds modify the temperature of a place?

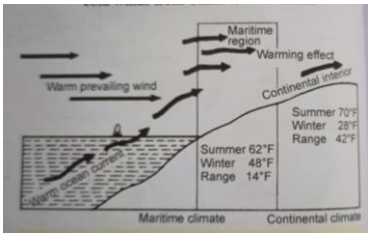
Ans.11 Winds carry the warmth and cold from one place to the other. For example, the lower latitudes are warmer than the higher latitudes; the winds blowing from the lower latitudes to higher ones increase the temperature of the higher latitudes.

12. What does Normal Lapse Rate mean?

Ans.12 The lapse rate is the rate at which the air variables normally the temperature falls within the altitude and laps is a general sense of the fall and is can be applied to any gradual parcel of the air as a gradient of the temperatures.

13. Explain with the help of a diagram how the slope of the land is affects the temperature.

Ans.13 Slope of land:-The relief features and slope of the land help in modifying the temperature in three ways:-

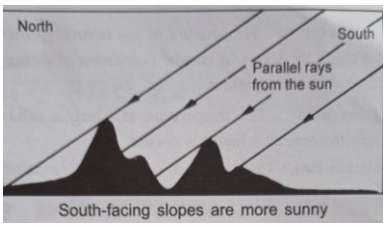


Slope of the Land

i. Presence of mountains acting as a barrier:-For example, Himalayas prevent the monsoon winds from leaving India and also prevent the cold winds from China to enter India.

ii. Inversion of temperature:-Steep slopes experience more changes in temperature than a gentle slope because of reversal of Normal Lapse Rate of temperature called *temperature inversion*. Normally, temperature decreases with height, but in some areas and during certain periods, temperature increases with height in the atmosphere. This occurs during the winter season over the land.

iii. Direction of slope of the land:-Slopes facing south in the northern hemisphere are warmer than those facing north because the sun rays strike the south facing slopes at a steeper angle than they do at the north facing slopes which are also called Sheltered slopes.



South-facing slopes are sunnier

14. Why does the temperature of a place in the atmosphere decrease with height?

Ans.14 In the troposphere, the temperature generally decreases with altitude. The reason is that the troposphere's gases absorb very little of the incoming solar radiation. Instead, the ground absorbs this radiation and then heats the tropospheric air by conduction and convection.

15. What causes Equable climate?

Ans.15 Equable climate is caused because they are situated close to or along the hence the influence of the sea has an effect on the temperature. Therefore the annual range in temperature is low.

16. State the reason for the differential heating of land and water?

Ans.16 Solar heating of the Earth's surface is uneven because land heats faster than water, and this causes air to warm, expand and rise over land while it cools and sinks over the cooler water surfaces. This differential heating is passed on to the air above by conduction which causes air expansion and changes in pressure.

B. Explain the following terms:-

1. Isolation:-Solar irradiance is the power per unit area, received from the Sun in the form of electromagnetic radiation as reported in the wavelength range of the measuring instrument.

2. Conduction:-In conduction, heat moves from areas of more heat to areas of less heat by direct contact. Warmer molecules vibrate rapidly and collide with other nearby molecules, transferring their energy.

3. Normal Lapse Rate:-The lapse rate is the rate at which the air variables normally the temperature falls within the altitude and laps is a general sense of the fall and is can be applied to any gradual parcel of the air as a gradient of the temperatures.

4. Inversion of Temperature:-Steep slopes experience more changes in temperature than a gentle slope because of reversal of Normal Lapse Rate of temperature called *temperature inversion*. Normally, temperature decreases with height, but in some areas and during certain periods, temperature increases with height in the atmosphere. This occurs during the winter season over the land.

C. Distinguish between the following pairs:-

1. Insolation and Terrestrial Radiation:-The incoming solar radiation to the earth is known as **insolation**. On the other hand, The upper layer of atmosphere absorbs some amount of heat from the rays of the sun as they pass through the atmosphere. Radiation from the earth is called **terrestrial radiation**.

2. Convection and Radiation:-In conduction, heat transfer takes place between objects by direct contact. In convection, the heat transfer takes within the fluid. In radiation, heat transfer occurs through electromagnetic waves without involving particles.

D. Give reasons for the following:-

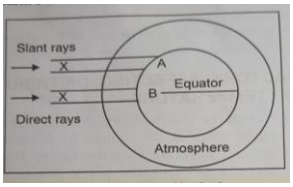
1. Land gets heated faster than the sea:-Land surfaces absorb much more solar radiation than water. **Water** reflects most solar radiation that reaches its surface back to the atmosphere. Since land absorbs more solar radiation the land surface retains more heat as do the vegetation for energy. Thus, land surfaces warm more quickly than water.

2. The climate of continental interiors is of comparatively extreme type:-The continental interiors are away from any water bodies so they cannot experience the moderating effect of the water bodies through land and sea breeze hence being away they face extremes of summer and winter.

3. Coastal climates are equable:-Coastal climates are equable because, Coastal areas will generally have more moderate temperatures than inland areas because of the heat capacity of the ocean. It is the amount of heat required to raise the temp of body by 1°C.

4. South-facing slopes in the Northern Hemisphere:-In the northern hemisphere a south-facing slope (more open to sunlight and warm winds) will generally be warmer and drier due to higher levels of evaporation and transpiration than a north-facing slope.

E. Diagrams:-



Effect of Latitude