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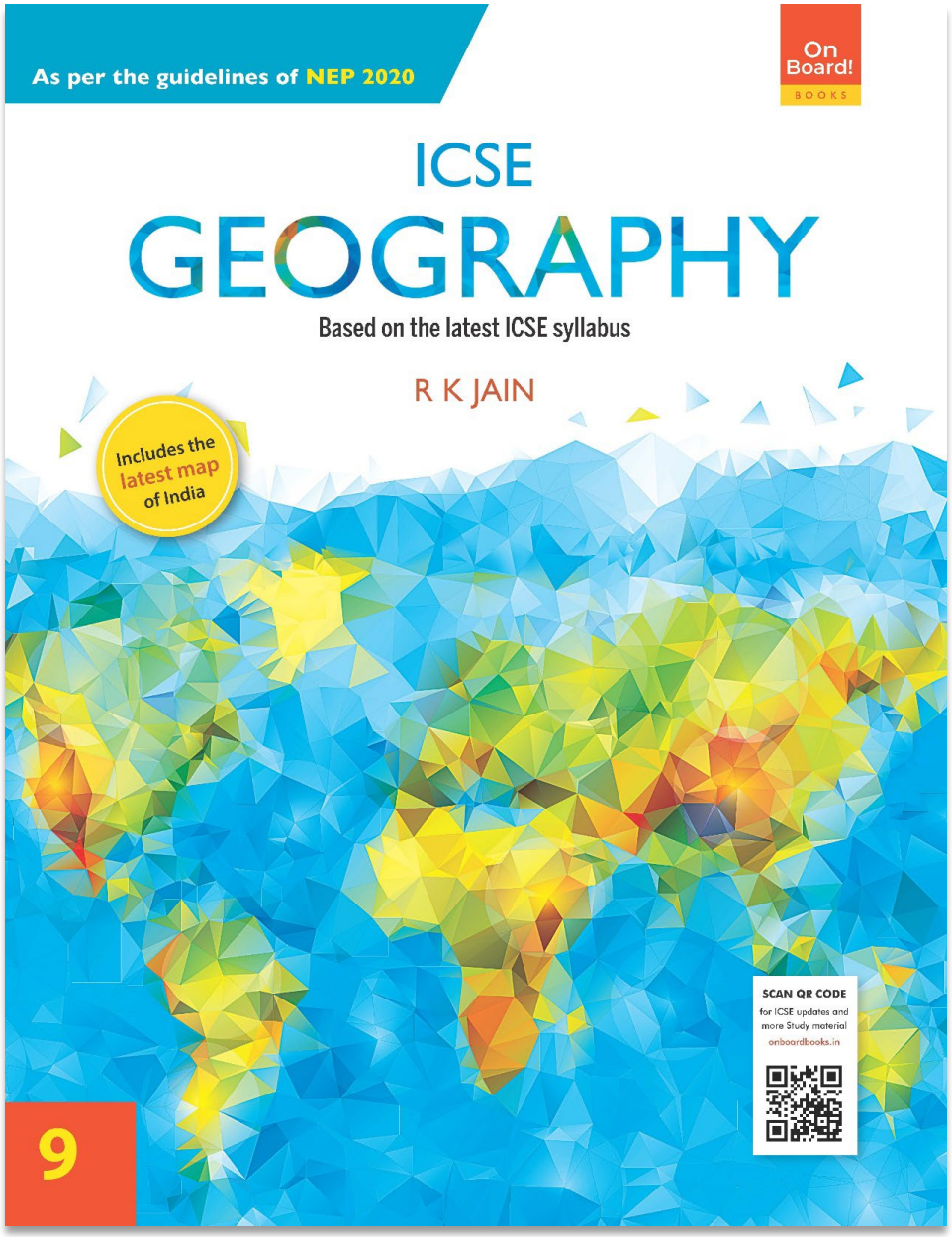
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9

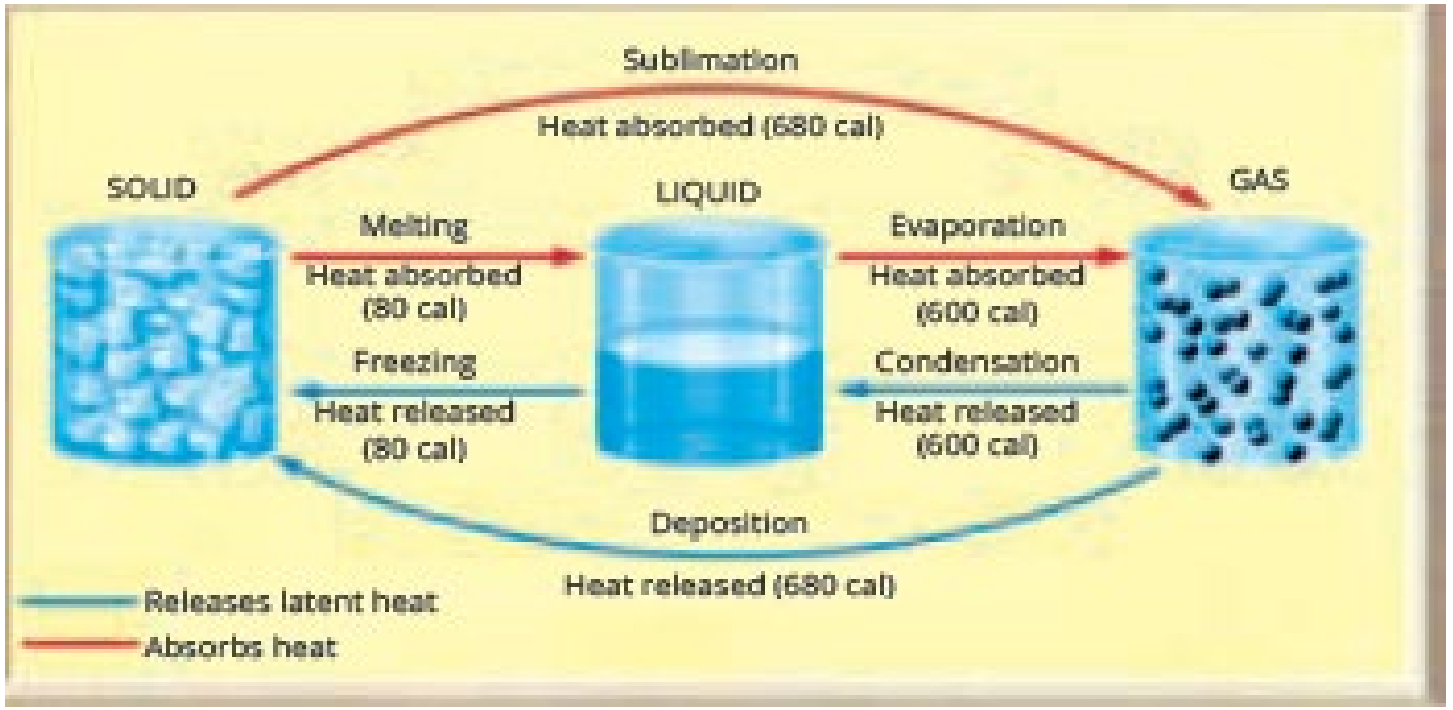
CONTENTS

ICSE GEOGRAPHY

Class 9

Chapter 15: Humidity

The three states of water – solid, liquid and gas – and their properties make it the most useful of all the compounds.



The three states of water

HUMIDITY

Humidity refers to the amount of water vapour present in the atmosphere at a particular time and place. Humidity in air is due to the various processes of evaporation from the land and water surfaces of the Earth. Humidity in the atmosphere is generally expressed as **absolute humidity** and **relative humidity**.

ABSOLUTE HUMIDITY

- Absolute humidity is the actual amount of moisture present in the atmosphere and differs from place to place and also from time to time in the atmosphere.
- The amount of absolute humidity decreases from the equator towards the poles.

RELATIVE HUMIDITY

- Relative humidity is a better way of expressing the level of humidity in the air, and it is always expressed in percentage.
- It is defined as the ratio between the actual amount of moisture present in the air at a given temperature (absolute humidity) and the maximum capacity of the air to hold moisture at that temperature (saturation point).

Any change in the relative humidity of the air can be due to:

a. the increase or decrease in the amount of moisture in the atmosphere at the same temperature, or

b. the increase or decrease of the air temperature without any change in the amount of moisture present in the atmosphere.

EVAPORATION AND CONDENSATION

The process of transformation of liquid (water) into gaseous form (water vapour) is called **evaporation**. It is due to gain of heat.

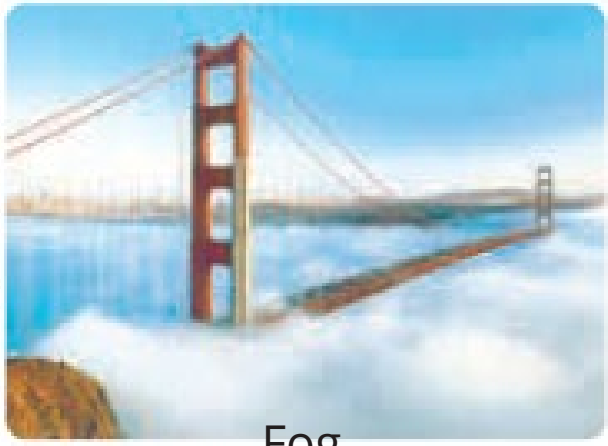
There is more evaporation from the ocean than from the land. A special case of evaporation is **transpiration** which entails loss of water from the leaves and stems of the plants.

The process of transformation of water vapour into water (liquid) and ice (solid) is called **condensation**.

Once the condensation of water vapour in the atmosphere has taken place, the moisture present in the atmosphere may take the forms such as **dew**, **frost**, **fog**, **mist**, **clouds**, etc. This will be according to the conditions prevalent in the atmosphere.

Dew

Frost



Fog

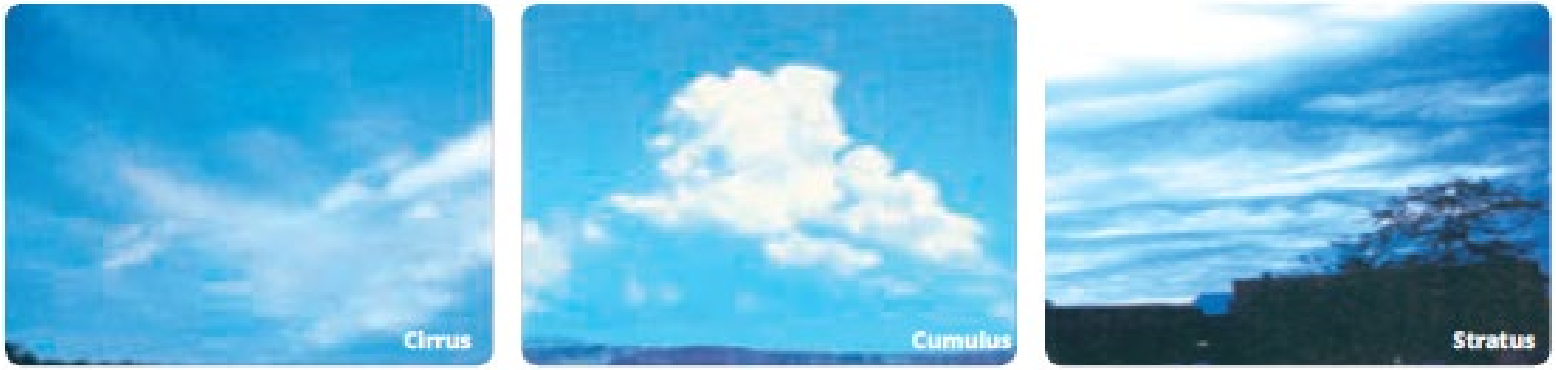
FORMATION OF CLOUDS

Evaporation takes place near the surface of the Earth. The water vapour being less dense than the dry air, rises upwards. As the moist air ascends, it expands, loses temperature, becomes cool, and gets saturated. With further decrease in temperature beyond the dew point, condensation of the moisture takes place high up in the air and it results in the formation of **clouds**.

- Clouds are droplets of water or tiny ice crystals which collect around the dust particles present in the atmosphere.
- All forms of precipitation occur from the clouds. It should be noted **that not all clouds yield precipitation but no precipitation is possible without the clouds.**

TYPES OF CLOUDS

There are different types of clouds which are usually classified on the basis of altitude and shape. These are the **cirrus** clouds, the **cumulus** clouds and the **stratus** clouds.



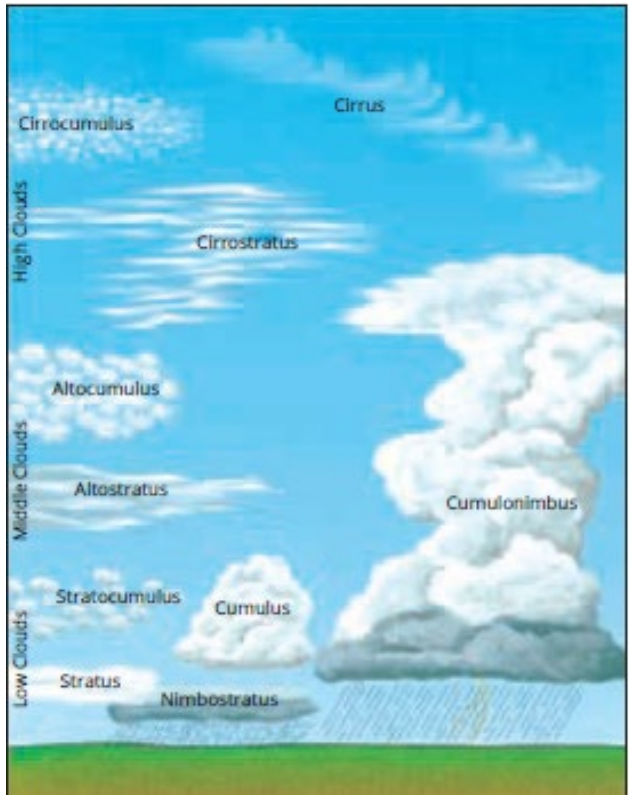
Types of clouds

1. The Cirrus clouds are high altitude detached clouds which have hair-like or silky appearance. They are composed of tiny ice crystals and indicate dry weather.

2. The Stratus clouds have uniform layers. They are low, dull, grey and featureless.

3. The Cumulus clouds are dense, widespread, dome-shaped and have flat bases. They are associated with fair weather but sometimes they become thunderclouds.

4. The Cumulonimbus clouds are dark grey clouds of great vertical development. These clouds produce heavy rains, snow or hailstorm.



Types of clouds

PRECIPITATION

The release of moisture in liquid or in solid form, after condensation of moisture in the atmosphere, is known as **precipitation**. Fog, mist, dew and frost are the various forms of condensation. These are not the forms of precipitation. The common forms of precipitation are **rainfall, snowfall, hailstorm, drizzle, sleet**, etc.

RAINFALL

Rain is the most important and most common form of precipitation. For rain to occur, the air mass must be saturated with water vapour.

TYPES OF RAINFALL

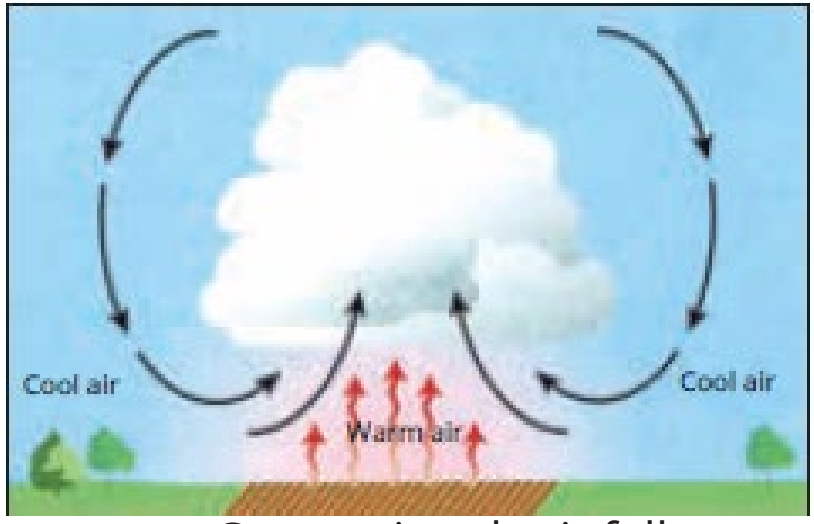
According to the way the cooling of the warm moist air mass takes place, the rainfall can be of the following three types:

Convectional Rainfall

The **mechanism of convectional rainfall** can be explained in the following manner.

a. The ground surface is intensely heated due to the insolation received during the daytime.

b. Thus the air coming in contact with the warm ground surface gets heated, expands and rises upwards.



Convectional rainfall

c. The ascending warm and moist air cools due to its expansion in the higher altitudes.

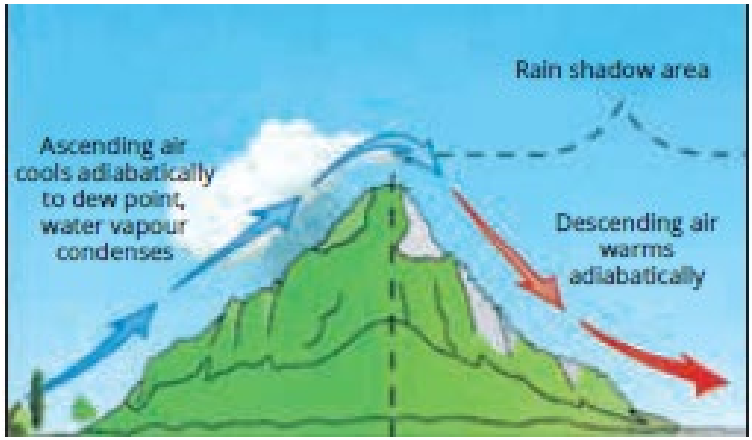
d. The cooling of the ascending air increases its relative humidity.

e. The moist air becomes saturated and further cooling causes condensation, cloud formation and then rainfall.

Orographic or Relief Rainfall

The **mechanism of orographic rainfall** can be explained in the following manner.

- ❖ This type of rainfall occurs when warm moist saturated air mass approaches a mountain barrier and is forced to ascend.
- ❖ The mountain barrier, lying across the direction of the moving air, forces the warm moist air to rise along the mountain slope.

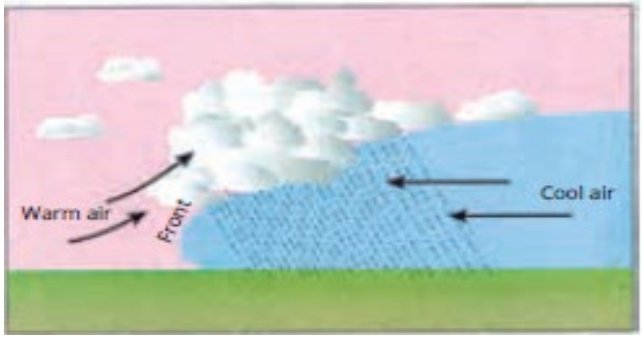


Orographic rainfall

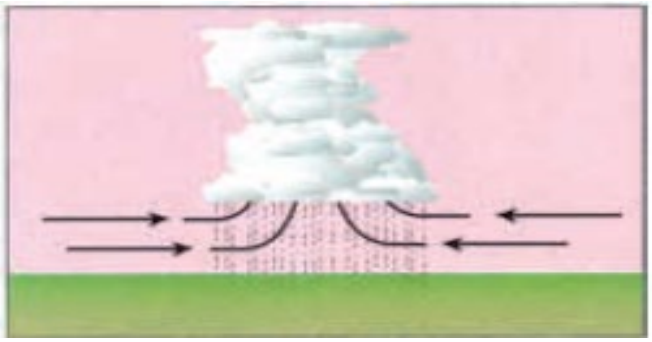
- ❖ As the air mass rises, it expands and loses temperature. This increases the relative humidity of the air mass.
- ❖ Consequently the ascending air becomes saturated and condensation begins.

Cyclonic or Frontal Rainfall

This type of rainfall is associated with the tropical and the temperate cyclones. The rain occurs when warm and cold air masses converge. In the cyclones, the winds from all sides converge towards the **eye** of the cyclone.



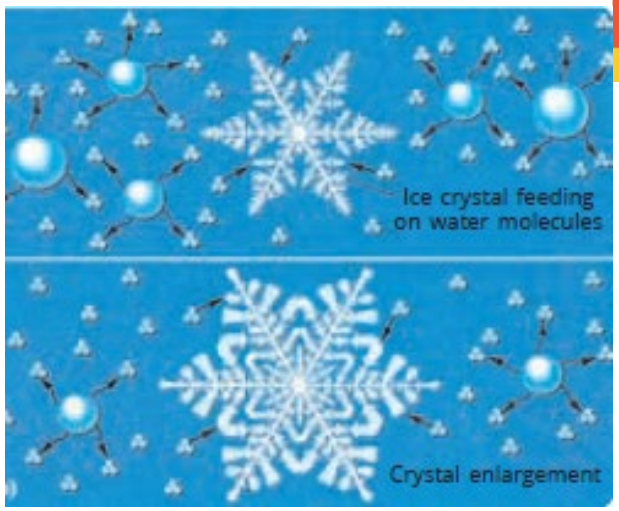
Cyclonic rainfall – Frontal



Cyclonic rainfall – Convergent

SNOWFALL

The temperature of the atmosphere decreases with increase in altitude. Condensation in the form of tiny ice crystals needs very low temperature. If the air mass is full of water vapour at a temperature below the freezing point, then the moisture from the atmosphere is released in the form of frozen ice crystals.



Snow-flake formation

- Once the water starts freezing in a cloud the ice crystals in **hexagonal shapes** start increasing in size.
- Due to melting on the edges, several ice crystals stick together to form **snow flakes**.

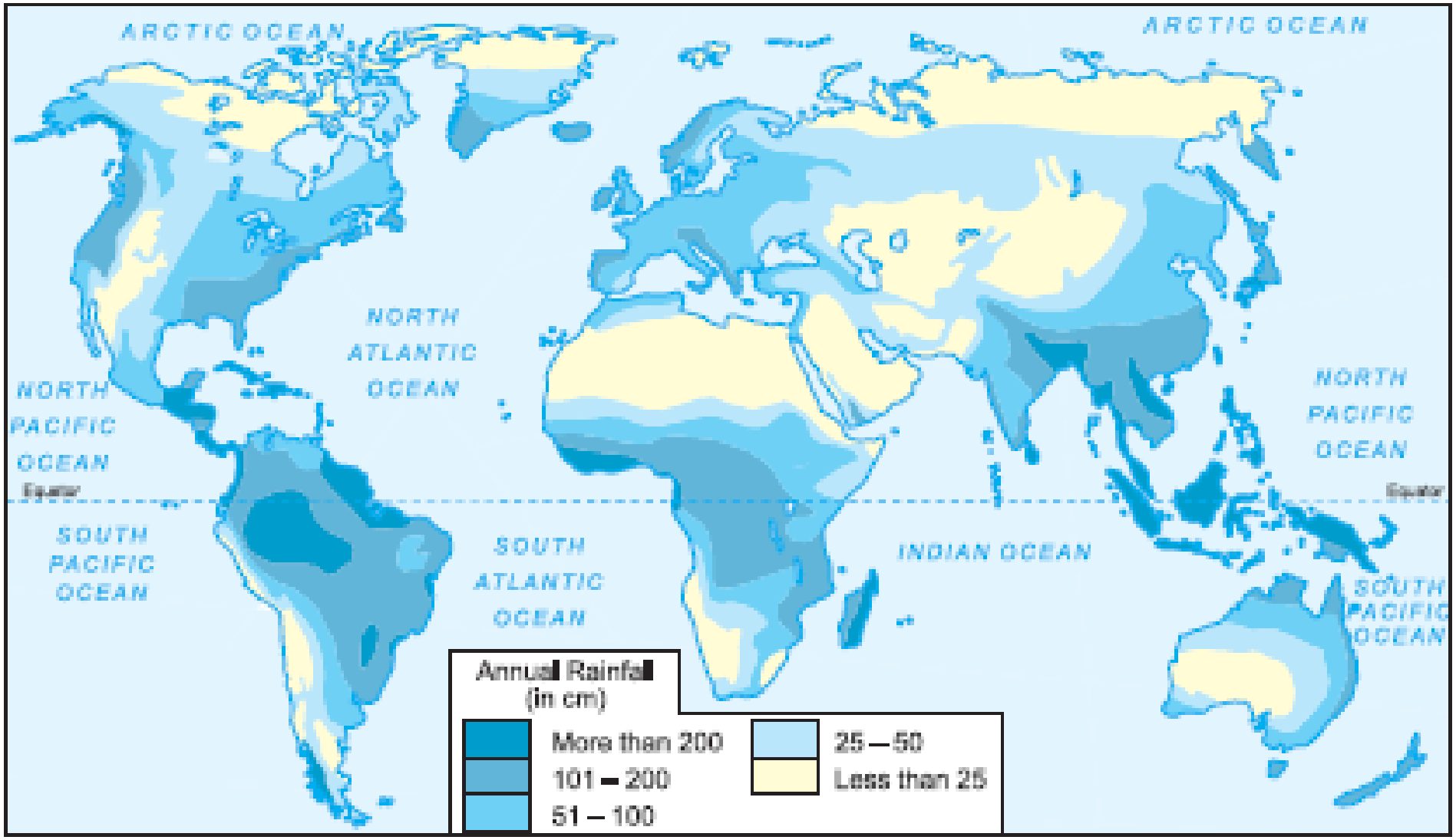
HAILSTONES

- Hailstones develop mostly in the cumulonimbus clouds. Small droplets of water are formed in the lower part of the clouds due to condensation. Many of them join together to form large ones.
- The strong rising convection current carries these raindrops to the higher levels, which causes freezing and gives rise to **small ice pellets**.


Hailstones

DISTRIBUTION OF PRECIPITATION

The mean annual rainfall on Earth is about 100 cm but it is not evenly distributed. Most of the annual rainfall is received during a few months of the year, while the rest of the months either remain dry or receive little rainfall.



World annual rainfall (in cm)

THANK YOU