5. Winds

Can you tell?

- See outside the window of your classroom. Which objects are moving? Which are still?
- Which objects are moving on their own?
- Which objects are not moving on their own? Why?

(Through these questions, make the students think of 'Winds'.)

We feel the wind but cannot see it. When certain objects in our surroundings move, we experience wind. The movement of air is called wind. Why does air move?

Try this.

(Get pairs of students to do this.)

- Fold a paper into two same-sized rolls.
- Keep both the paper rolls on one side of a table.
- You and your friend should select one roll each.
- Without touching the role of the paper or the table, what can be done to move the paper rolls to the other end of the table?

Figure 5.1 : Generation of wind

- See who moves the paper roll first to the other end of the table.
- What could be the reason of the delay in making the rolls reach to the other end of the table?
- What can we do to move the rolls to the other end of the table with a greater speed?
- Can a bottle filled with water be moved to the other end of the table in this manner? Can we use the same method that you tried for moving the paper rolls?

Geographical explanation

We have learnt that the air pressure is not uniform across the earth's surface. Air moves from high pressure areas towards low pressure

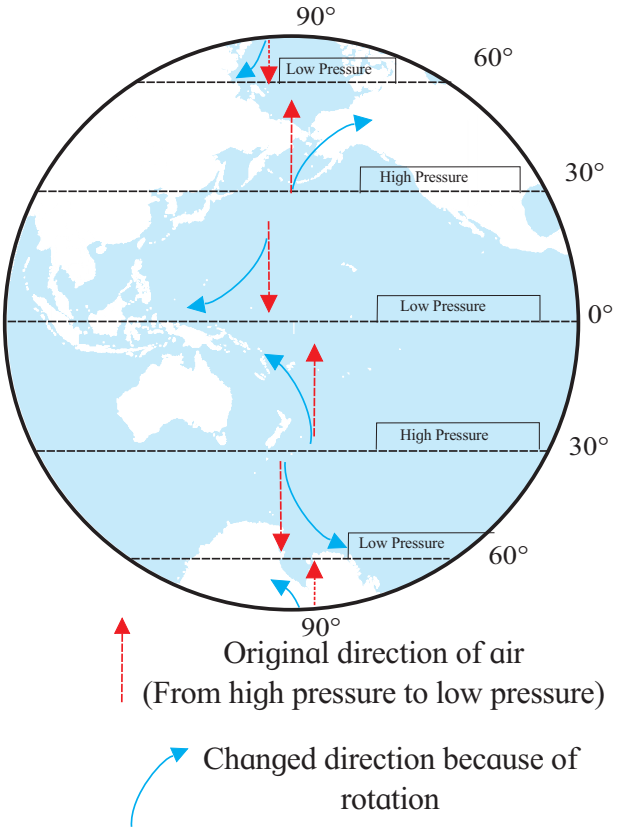


Figure 5.2 : Change in direction of winds

areas in a horizontal manner. Winds are generated due to this movement.

The extent of the difference in the air pressure affects the velocity of the wind. If there is less difference in the pressure, winds blow with less velocity. Winds blow with greater velocities if the pressure difference is greater. Wind speed also varies. Wind velocity is measured in the units of knots or kilometres per hour.

Give it a try.

Write the changed direction of the wind in the table below:

Pressure Belts	Northern Hemisphere	Southern Hemisphere
Mid Latitudes		
Poles		

When we consider the earth as a whole, we find the direction of the winds is influenced by the rotation of the earth. In the northern hemisphere, winds get deflected towards the right of their original direction, whereas in the southern hemisphere they get deflected towards the left of their original direction. See fig. 5.2. This direction has been shown by curved arrows in the figure. The rotation from west to east causes this change in the original direction of the winds.

Can you tell ?

Observe fig. 5.3 and answer:

- Which are the winds in the northern hemisphere that blow from the mid-latitudinal high pressure belt to the equatorial low pressure belt?
- What is the direction of the Westerlies in the southern hemisphere?
- Which planetary winds blow from the mid-latitudinal high pressure belts to the subpolar low pressure belts in the northern hemisphere?
- Why is the direction of polar winds not the same in both the hemispheres?
- Name the winds that blow in the southern hemisphere?
- In which direction do the Easterlies blow in the northern and southern hemispheres?

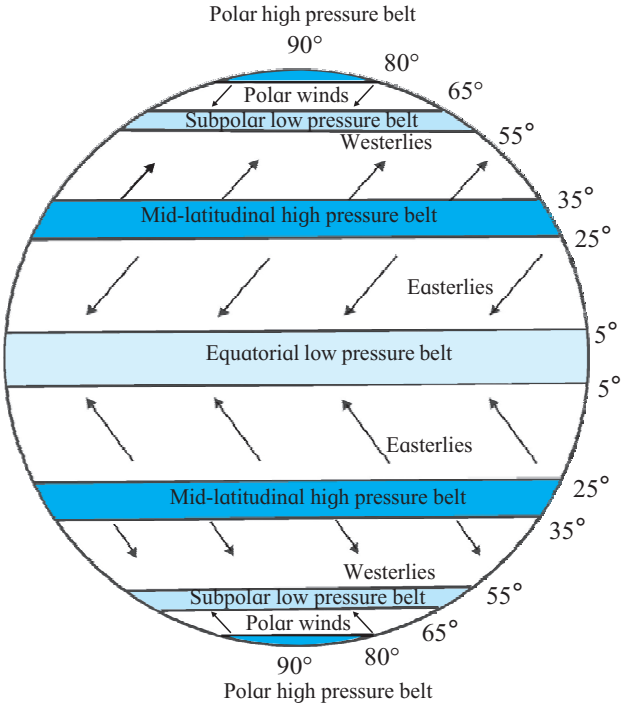


Figure 5.3 : Planetary winds and pressure belts on the earth

Winds are known by the direction from which they blow. For example, Westerlies are winds that blow from the west. The direction of blowing, the duration, the regions covered, and the condition of the air determine the following wind types:

Planetary winds:

Some winds blow regularly on the earth from high to low pressure belts throughout the year. These winds cover a large portion of the earth, hence these are called planetary winds. For example, the Easterlies, the Westerlies and the Polar winds.

In both the hemispheres, the winds blow from the high pressure area between 25° and 35° parallels, to the equatorial low pressure belt. (See fig. 5.3.) Due to the rotation of the earth, their original direction changes. In the northern hemisphere, they blow from the north-east to the south-west whereas in the southern hemisphere they blow from the south-east to the north-west. These winds

coming from both the sides converge near the equatorial calm belt. These winds are known as the Easterlies.

In both the hemispheres, winds blow from the mid-latitudinal high pressure belt to the subpolar low pressure belt situated near 60° parallel. (Fig. 5.3.) Their original direction changes due to the rotation of the earth. In the southern hemisphere, these winds blow from the north-west to the south-east and in northern hemisphere, they blow from the south-west to the north-east. These winds are called Westerlies.

In both the hemispheres, winds blowing from the polar high pressure belt to the subpolar low pressure belt (55° to 65°) are called Polar winds. Generally, they blow from east to west.

Do you know?

Winds in the southern hemisphere blow with great velocities. The southern hemisphere is mostly occupied by oceans. In this hemisphere the obstacle caused by the relief of the land surface is almost absent. As there is no obstacle; winds blow with greater velocities in the southern hemisphere as compared to the northern hemisphere. Their characteristics are as follows:

- Beyond 40° S, winds blow with tremendous velocities. These winds are called Roaring Forties.
- Around 50° S, winds are stormy. Hence they are called Furious Fifties.
- The stormy winds around 60° S make tremendous noise and hence they are called Screeching Sixties.

Why are such winds not found in the northern hemisphere at 40°, 50° and 60° parallels?

Local winds:

The winds that blow for a short duration of time, originate in specific regions and blow over a limited area are called local winds. Local winds affect the climate of the region where they blow. These winds are known by different local names in the different regions where they blow.

Try this.

In the activity given below, consider the elevation of land, the heating and cooling properties of land and water, the air pressure, etc.

(A) Observe the picture. (Fig. 5.4 a.) Describe the valley breeze with the help of the picture.

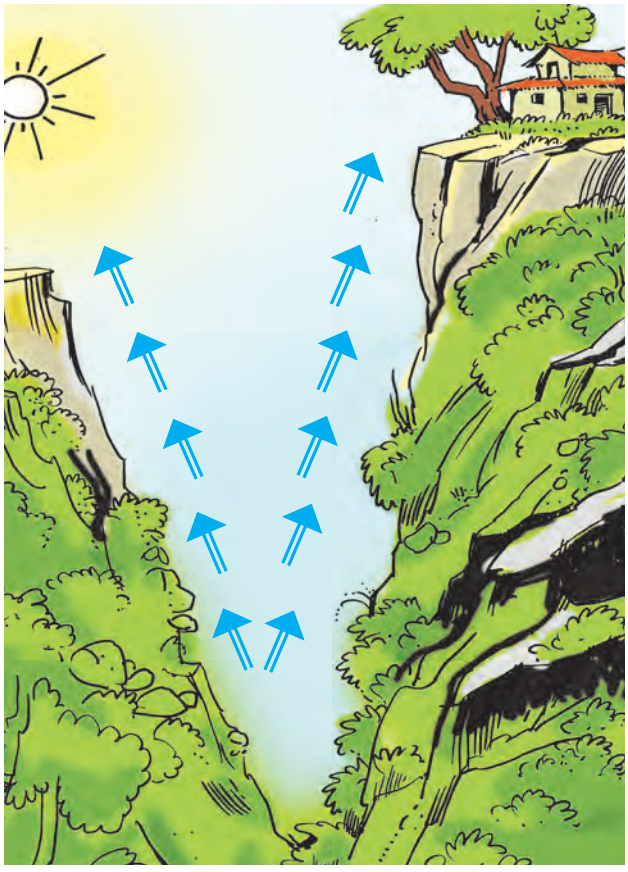


Figure 5.4 a : Valley breeze

Characteristics of Valley Breeze

- ❖
- ❖
- ❖
- ❖
- ❖
- ❖

Figure 5.4 b : Mountain breeze

(B) Read the following information carefully and draw a diagram for the mountain breeze accordingly.

Characteristics of the Mountain breeze:

- Mountains cool down quickly at night.
- The valley zone is comparatively warmer.
- Air pressure is greater on the mountains.
- Winds blow from the mountain towards the valley.
- The hot and light air from the valley is pushed upwards and the cool air rushes down into the valley.
- Mountain winds set in after sunset.

Do you know?

The region up to 5° north and 5° south of the equator remains calm for most of the year and winds do not blow in this region. It is called the equatorial calm zone or Doldrums.

In the area near the Tropic of Cancer and Tropic of Capricorn, that is, between 25° and 35° north and south, there exists a high pressure belt. This is also a calm belt. This belt is known as Horse Latitudes.

Can you tell?

Observe the diagrams given below. Answer the questions related to sea and land breezes.

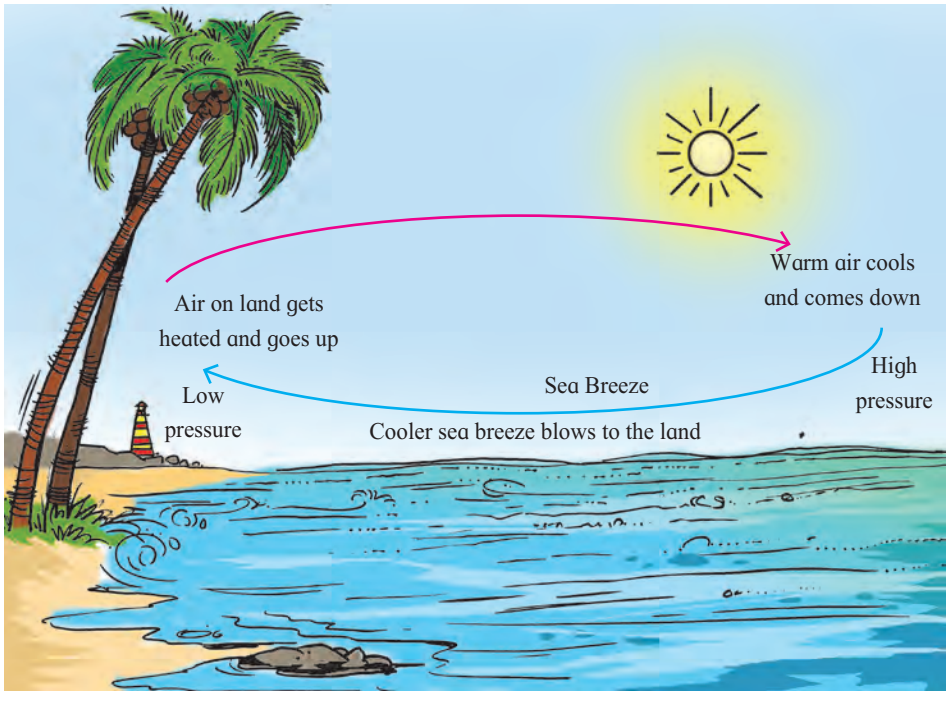


Figure 5.5 a : Sea breeze

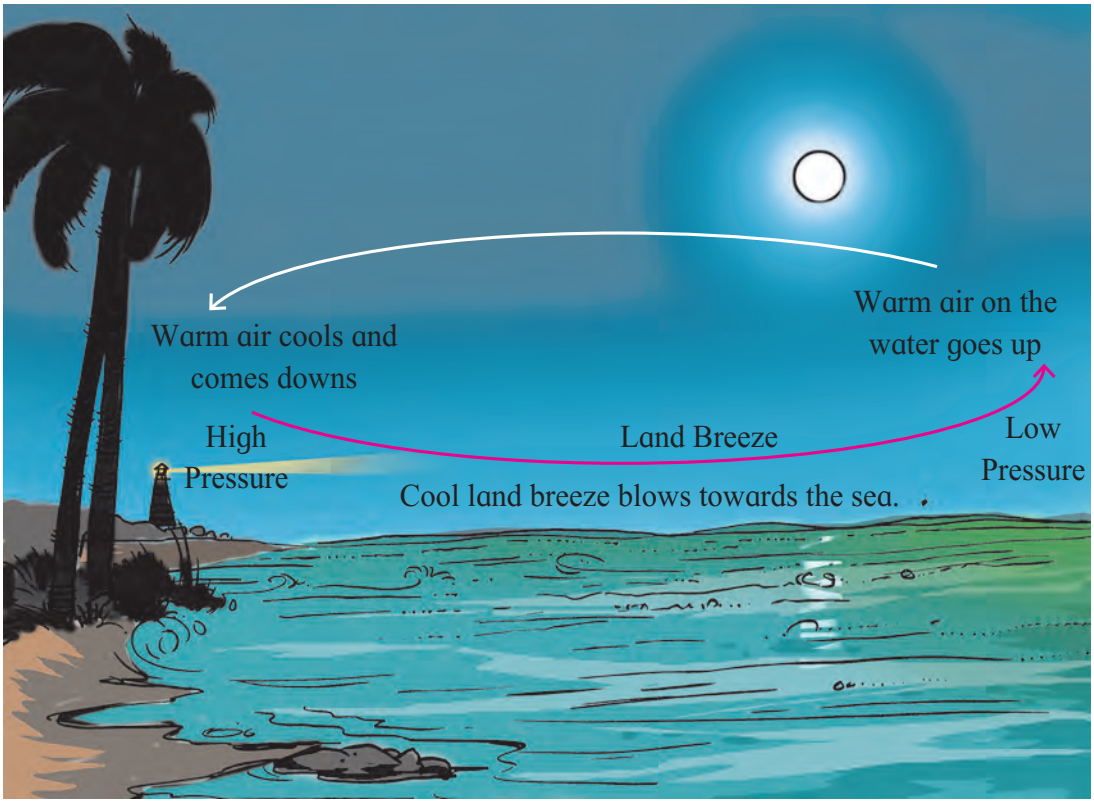


Figure 5.5 b : Land breeze

- Why do the breezes blow from the sea to the land during the day?
- When do the winds blow from the land to the sea?
- Describe the winds shown in fig. 5.5 a.
- Compare fig. 5.5a and 5.5b with reference to temperature conditions, air pressure and winds.
- Which winds are called sea breezes and which are called land breezes ? Why?
- In which part of India are the land and sea breezes experienced?
- Do you experience sea and land breezes in your area?

Geographical explanation

The land is made up of dense matter. Land is stable and opaque. As a result, heat is transferred at a greater speed and in a higher proportion. Hence, land gets heated quickly.

The density of water is comparatively less. Water is transparent and unstable. Hence, water does not get heated quickly. As a result, the air pressure in land and water areas is different.

In the coastal areas, land gets heated during daytime. Hence, the air on the land also gets heated and the air pressure on land decreases. The sea water gets heated slowly hence the air is less heated and the air pressure remains high. Winds blowing from the sea towards the land are called sea breezes. At night, land cools down faster as compared to the sea and therefore has higher air pressure. Hence, the land breeze blows from land towards the sea.

Besides these, winds blow under particular conditions in different areas. These are also called local winds. For example, Fohn, Chinook, Bora, Loo, etc. See the table on the next page.

Do you know?

Major local winds in the world

Name of the wind	Nature of the wind	Characteristics and areas of influence
Loo	Hot and dry	Blows in the North Indian plains during the summer season generally in the afternoons. They come from the hot Thar Desert.
Simoom	Hot, dry and destructive	These blow with tremendous velocities from the Sahara and Arabian deserts. As these winds are quite strong they are destructive.
Chinook (Snow eater)	Warm and dry	These blow down the eastern slopes of Rocky Mountains of North America. They cause the snow to melt and increase the temperature in the valleys.
Mistral	Cold and dry	These blow in Spain, France and areas the around the Mediterranean Sea. They originate from the Alps. These cold winds reduce the temperature in the coastal areas.
Bora	Cold and dry	These blow from the Alps Mountains towards the coastal areas of Italy.
Pampero	Cold and dry	These blow around the Pampas grasslands in South America.
Fohn (foehn)	Hot and dry	These blow along the northern slopes of the Alps.

Seasonal winds (Monsoon):

Monsoon winds are generated due to the uneven heating of land and water in the different seasons. During summers, Monsoons blow from the sea to the land and in winter they blow from the land to the sea. Southeast Asia, East Africa, North Australia are the regions where the pronounced effects of these winds are felt. (See fig. 5.6.) The influence of monsoon winds is seen in the summer and winter seasons in the Indian subcontinent. Due to these winds, the Indian subcontinent experiences monsoon (rainy) and retreating monsoon seasons apart from summer and winter.

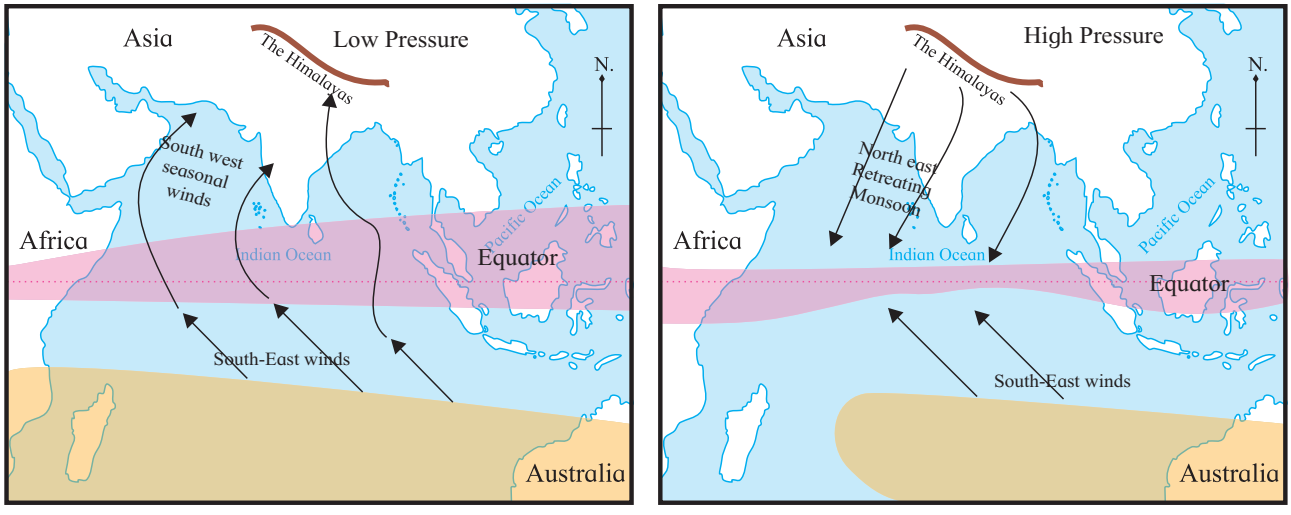


Figure 5.6 : Seasonal winds

Equatorial low pressure belt

Mid-latitudinal high pressure belt

Monsoon winds are in fact sea and land breezes blowing on large scale.

Most of the precipitation in the Indian subcontinent is the effect of monsoon winds. After crossing the equator, they blow from the south-west towards the Indian subcontinent during the period from June to September. They are called the south-west monsoons. They are full of moisture.

From September to December, because of the low pressure area developing near the equator, winds blow from the Indian subcontinent towards the equator. These are called the north-east monsoon winds. They are dry winds.

Cyclones:

Cyclonic conditions are created when a low pressure area is surrounded by high pressure areas. In these conditions, winds start blowing towards the low pressure area from the surrounding high pressure areas. (See fig. 5.7.) Due to the rotation of the earth, the cyclonic winds in the northern hemisphere move in an anticlockwise direction, whereas they move in a clockwise direction in the southern hemisphere. During a cyclone, the sky is cloudy, winds blow with a very high velocity and it rains heavily. The area affected by cyclones is limited. The duration, velocities, direction and place of origin of these winds is unpredictable. See the image of a cyclone obtained by a satellite in fig. 5.8.

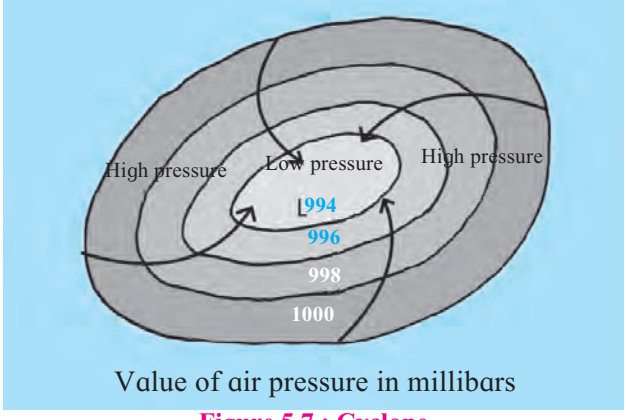


Figure 5.7 : Cyclone

On weather maps, the centre of a cyclone is represented by the letter 'L'. A cyclone system moves from one place to another.

Cyclonic storms:

Cyclones occurring in the western part of the Pacific Ocean along the coasts of Japan, China, Philippines, etc. are known as 'Typhoons'. These storms arise in the months between June and October. Due to high velocity winds and heavy rains, these prove to be destructive.

The cyclones in the Caribbean Sea are known as hurricanes. These are also destructive in nature. During these storms, the minimum velocity of the wind is 60 km per hour. Cyclones also originate in the temperate zone but they are not so powerful and hence are not destructive.

Figure 5.8 : Cyclonic storm

Anticyclones:

Under specific atmospheric conditions, the air pressure in a particular region increases and the pressure in the surrounding areas remain low. In this situation, winds blow from the centre towards the surrounding areas in a circular manner. In the northern hemisphere, these winds blow in a clockwise direction whereas in the southern hemisphere, they blow in an anticlockwise direction. During anticyclones, the skies are clear, winds blow with lesser velocities and the weather is pleasant.

Anticyclones generally last for a few days or a week. Such anticyclones originate in temperate zones.

On weather maps, the centre of an anticyclone is represented by the letter 'H'. Anticyclones are vividly experienced in high pressure belts. Winds in these regions are always moving out and hence the rainfall in such areas is quite low.

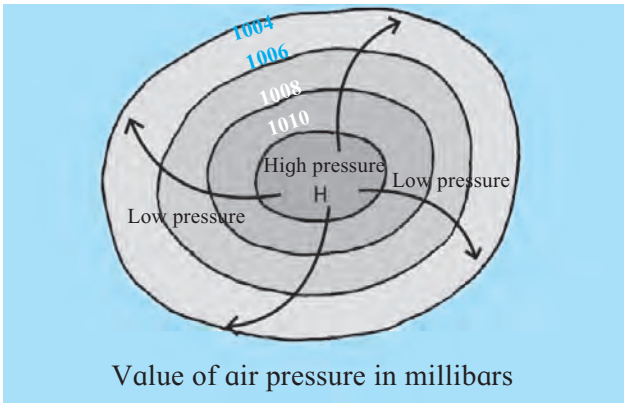


Figure 5.9 : Anticyclone

Do you know ?

Naming the cyclones:

Cyclones occurring in different parts of the world are assigned different names. A list of names is prepared for each of the oceans or its part. Names in the list are suggested by the countries in the region of that ocean. If the wind speed in the storm exceeds 33 knots (60 km/hour) the cyclone is assigned a name. Names make it easier for us to remember a particular storm.

Look for me elsewhere !

- Class Six- Lesson Five- Temperature
- Class Seven- Science.

Exercises

Q.1. Rewrite the following statements after choosing the correct option.

(1) When the air expands, it ..... .
(a) becomes solid
(b) becomes thinner
(c) gets lost
(d) becomes humid

(2) From high air pressure regions, winds ..... .
(a) blow to regions of still higher pressure.
(b) blow towards regions of cooler air.
(c) blow towards regions of low air pressure.
(d) remain still.

(3) In the northern hemisphere, winds blowing towards the equator ..... due to the rotation of the earth.
(a) turn to the south
(b) turn to the east
(c) turn to the west
(d) turn to the north

(4) The direction of seasonal winds blowing over the Indian subcontinent during winter is from the ..... .
(a) south-east to north-west.
(b) south-west towards north-east.
(c) north-east to south-west.
(d) north-west to south-east.

(5) The Roaring Forties in the southern hemisphere
(a) blow towards the equator.
(b) blow in the areas around 40° S parallel.
(c) blow from the subpolar region of low pressure.
(d) blow around 40° N parallel.

Q.2. Identify the type of winds from the description given below.

(1) These winds from the south-west bring rains to the Indian subcontinent. During June to September, India gets rains. After this period these winds retreat.

(2) These winds blowing from the north pole region towards 60° N parallel cause cold wave conditions in extensive areas covering North America, Europe and Russia.

(3) Hilltops get heated quickly during the day. The air in this part becomes hot, light and starts ascending. Hence, a low pressure area forms in this region. At the same time the air at the foothills being cooler, and that area experiences high pressure. Air in that area blows towards low pressure.

Q.3. Given below are the values of air pressure in millibars. Using the same, draw diagrams to show a cyclone and an anticyclone.

- 990, 994, 996, 1000
- 1030, 1020, 1010, 1000

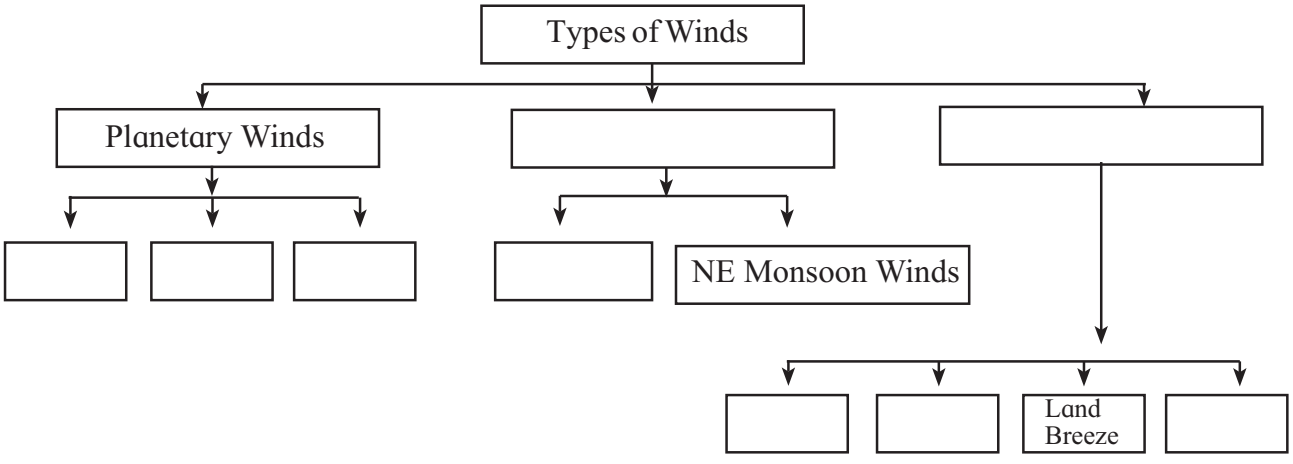
Q.4. State one reason why.

(1) A belt of calm exists near the equator.

(2) The winds coming from the north-west in the southern hemisphere have greater velocities than the winds coming from the south-west in the northern hemisphere.

(3) The monsoon winds in the summer come from the sea but the retreating monsoon winds in winter come from land.

Q.5. Complete the flow chart:



Q.6. Answer in short:

(1) Why is the air pressure high in polar areas in both the hemispheres?

(2) What effect does the rotation of the earth have on the winds?

(3) Why do the cyclonic winds blow in a circular manner?

(4) State the reasons that lead to the formation of cyclones and describe the effects of cyclones.

Activity :

Using the internet, obtain information, photos and maps of the recent cyclone that arrived at India's eastern coast. Write the social and economic effects of that cyclone.

ICT Question :

Use the mobile app 'Windyty' and try to know the direction of winds and pressure areas in the world.

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