Chapters : Cyclones and Storms

Question 1.

Why do fall leaves rise in the air or trees bend when a strong wind blows?

Answer:

The force exerted by the wind creates wind pressure, which causes fallen leaves to rise in the air and the bending or swinging of trees when a strong wind blows.

Question 2.

Can the shape or size of the straps make a difference, provided both bags are equally heavy?

Answer:

We know that Pressure = Force / Area. When we carry a bag, we feel its weight because of the force of gravity acting on our shoulders. If the straps has larger area, then less pressure will be exerted on our shoulder. On the other hand, if the straps are narrower ie smaller area then more pressure will be exerted on our shoulder. Broad straps reduce the pressure exerted by the bag on the shoulders.

Question 3.

(a) Why are overhead tanks kept at a height?

(b) Suppose you are living on the second floor of a three-story building and an overhead tank is placed on the top floor. Will you or your friend on the first floor receive a more powerful stream of tap water? Give reasons.

Answer:

(a) Overhead tanks are placed at a height so that the pressure in the taps is increased, resulting in a good stream of water from the taps.

(b) Pressure exerted by water increases with the increase of height of the liquid column. Suppose I live on the second floor of the building that has three floors, and the overhead tank is installed on the top floor. The pressure of water and hence the power of water stream from the taps will depend on the height of the overhead tank above the taps of the second floor. My friend living on the first floor will have a longer distance from the taps to the overhead tank, which means the height of the water column above his taps will be more compared to my water taps on the second floor. Therefore, my friend will receive more powerful stream of tap water

Question 4.

Why does water spurt out like a fountain from leaking joints or holes in water pipes?

Answer:

Water in water pipes has long water columns, as the water tanks to which the water pipes are connected are placed at heights. The pressure inside the pipes is high. The water exerts pressure in all sides of the container including the bottom and walls of the pipe. When this water exerting pressure on all sides, finds a narrow opening like a hole or a leaking joint, it spurts like a fountain.

Question 5.

What happens when an inflated balloon is kept without closing its mouth? (Page 86)

Answer:

The inflated balloon has air inside, which exerts pressure on the walls of the balloon, resulting in expansion of the balloon on all sides. The elastic walls of the balloon exert equal but opposite pressure on the air. When we keep the inflated balloon without closing its mouth, the air from within the balloon escapes through its mouth from high pressure inside the balloon to low pressure outside the balloon.

Question 6.

Does the difference in air pressure have anything to do with the formation of winds?

Answer:

Air moves from a high-pressure region to a low-pressure region. Moving air is called wind. Thus, it is the difference in air pressure that results in the formation of wind.

Question 4.

An elephant stands on four feet. If the area covered by one foot is 0.25 m^2, calculate the pressure exerted by the elephant on the ground if its weight is 20000 N.

Answer:

Force (the weight) of the elephant acting on the ground = 20000 N

Area on the ground covered by the four feet of the elephant = 4 × 0.25 m^2 = 1 m^2

Pressure exerted by the elephant on the ground

Question 6.

Would lightning occur if air and clouds were good conductors of electricity? Give reasons for your answer.

Answer:

In case the air and the clouds were good conductors of electricity, the charges could not accumulate in the clouds (because they would flow into the air), there would be no charge buildup, which is necessary for lightning to occur. Therefore, if air and clouds were good conductors of electricity, lightning would not occur.

Question 7.

What will happen to the two identical balloons A and B as shown in Figure when water is filled into the bottle up to a certain height? Will both the balloons bulge? If yes, will they bulge equally? Explain your answer.

Question 8.

Explain how a storm becomes a cyclone.

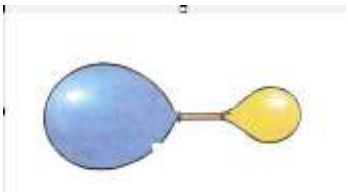
Answer:

Cyclones are large storms that form over warm ocean waters.

- As the ocean water gets heated, the air above it becomes moist and warm and rises to a height where water vapor condenses to form raindrops.
- Condensing water vapor releases heat back into the atmosphere.
- This further warms the ascending air, leading to its further rise, creating an even lower pressure.
- Air from the surrounding regions rushes in, and it also starts rising.
- The moving air starts to spin under the influence of the Earth's rotation.
- This cycle is repeated, resulting in the creation of a very low-pressure area with high-speed winds revolving around it.
- This spinning system of clouds, winds, and rain is called a Cyclone.

Question 10.

Describe an activity to show that air flows from a region of high pressure to a region of low pressure.



Answer: Activity to show that air flows from a region of high pressure to a region of low pressure.

Materials required: Two similar balloons made of thin rubber, a drinking straw, and some thread.

Procedure:

- Insert one end of the straw into one balloon and secure it with the thread.

- Inflate the second balloon and insert the free end of the straw into the neck of the inflated balloon, and secure it with the thread. (Ensure that the air from the inflated balloon does not leak.)

Observations: Some air moves from the inflated balloon to the uninflated balloon, and the sizes of both balloons change. After some time, both the balloons attain almost the same size, and the flow of air stops.

Conclusion: The inflated balloon has higher pressure inside it, and the uninflated balloon has low pressure inside. When the two balloons are connected through a straw, air moves from the high-pressure area (inside the inflated balloon) to the low-pressure area (inside the uninflated balloon).

Question 11.

What is a thunderstorm? Explain the process of its formation.

Answer:

A storm accompanied by lightning and thunder is called a thunderstorm.

Process of formation:

1. When the land gets heated, the warm and moist air rises, creating a low pressure area. Cooler air from surrounding high pressure regions rushes in, setting up a continuous wind circulation.
2. As the rising air cools, the moisture in it condenses to form water droplets, creating clouds. These droplets merge and fall as rain, hail, or snow. Strong winds with rain form a storm.
3. When the warm air rises to great heights, the low temperature there turns water droplets into ice particles.
4. Strong winds moving upwards and downwards cause rubbing between water droplets and ice particles, which develops static electric charges in the clouds.
5. When the charge buildup becomes very large, the insulating property of air breaks down, and a sudden flow of charges produces lightning. Lightning heats up the air, which expands and produces a loud sound called thunder.

Question 12.

Explain the process that causes lightning.

Answer:

Lightning is caused by the discharge of electric charges in the atmosphere. The process is as follows:

- Inside a thundercloud, strong winds cause collisions between tiny rain droplets and ice particles.
- These collisions result in the build-up of electrical charges: positive charges accumulate at the top of the cloud and negative charges gather at the bottom.
- The ground below the cloud becomes positively charged due to the influence of the negatively charged cloud base.
- When the difference in charges between the cloud and the ground becomes very large, the electrical energy is released suddenly in the form of a bright flash called lightning.
- This lightning is a giant spark of electricity that jumps through the air and equalizes the charges.

Question 13.

Explain why holes are made in banners and hoardings.

Answer:

Holes are made in banners and hoardings hanging in the open to reduce the wind resistance. When the wind blows, it exerts a force on the surface of the banner or hoarding. If there are no holes, the wind force can cause the banner to flap excessively or even tear. By making holes, the wind can pass through the banner, reducing the force exerted on it and thereby minimizing the risk of damage