Air Exerts Pressure: The pressure exerted by air is called air pressure. The air in the atmosphere exerts pressure on every object and in all directions (up, down, left, right, etc.).

▪ The pressure exerted by the atmosphere depends on many factors. For example, it depends on the height of a place and also on the temperature. Generally, places at a lower temperature are at a higher pressure than places at a higher temperature. Air moves from an area of higher pressure to an area of lower pressure. This causes wind. The converse is also true. Moving air causes a variation in pressure.

▪ **Applications of air pressure**:

▪ **Drinking straw**: when a drink is sucked with the help of a straw the air inside the straw goes into our lungs and thus air pressure in the straw decreases. The atmospheric pressure acting on the free surface f the liquid pushes the liquid into the straw and then into our mouth.

▪ **Fountain pen**: ink can be filled in a fountain pen with the help of atmospheric pressure. When the tube of the pen is squeezed the air in it rushes out so that the pressure in the tube decreases. The air pressure outside the tube pushes the ink to the pen.

Aim: To show that air expands on heating

Material Required: A small balloon, two buckets/mugs, hot water, and ice

Procedure:

1. Blow air into the balloon so that its surface becomes smooth.
2. Place the balloon in very cold ice water in a bucket/mug and leave it for some time. Observe what happens to the material of the balloon.
3. Now take some very hot water (the water should be as hot as you can bear to touch) in a bucket/mug and place the balloon in it for some time.

Observation: When the balloon is placed in ice-cold water, it develops wrinkles. The wrinkles disappear and the balloon gets back its shape when it is placed in hot water.

Conclusion: The balloon develops wrinkles because the air inside the balloon contracts. It gets back to its original shape when it is heated because the air inside the balloon expands.

▪ On heating air expands and occupies more space. When the same thing occupies more things it becomes lighter. The warm air is lighter than cold air. That is why smoke which is warm also rises up. As warm air rises, it leaves its place.

▪ This decreases the air pressure at that place. As a result cold air from other place rushes to occupy this empty space. This set up air current. This air current is called convection of air.

▪ **Wind:** Wind is the movement of air (usually in a horizontal direction) in the atmosphere. It is caused by a difference in temperatures between different regions on the Earth.

▪ This temperature difference occurs mainly because of the uneven heating of different parts of the Earth's surface by the sun.

▪ Thus, the air absorbs different amounts of heat, making it warm in places and cool in others. As air gets warmer, its particles spread out. In other words, air expands on heating. This makes the air lighter, or less dense, so it rises. As air cools, it becomes heavier, or more dense, and sinks.

▪ As warm air rises, air from cooler areas flows in to take the place of the rising air. This sets up a current of air and we call it wind.

(a) Uneven heating between the equator and the poles:

▪ The region of Earth receiving the Sun's direct rays is the equator. Here, air is heated and rises, leaving low pressure areas behind.

▪ Moving to about thirty degrees north and south of the equator, the warm air from the equator begins to cool and sink. Between thirty degrees latitude and the equator, most of the cooling sinking air moves back to the equator.

▪ The rest of the air flows toward the poles. The air movements toward the equator are called trade winds - warm, steady breezes that blow almost continuously.

(b) Uneven heating of land and water:

▪ During summer, the land warms up faster near the equator and most of the time the temperature of the land is higher than that of water in the oceans. This results in the heating of air. The heated air rises. This causes the winds to blow from the oceans towards the land. These winds are called monsoon winds.

▪ The word monsoon is derived from the Arabic word 'mausam', which means 'season'. Monsoons blow from the land toward the sea in winter and from the sea toward land in the summer.

▪ India's winters are cold and dry. The monsoon winds blow from the northeast and carry little moisture.. Most of India lies between the Tropic of Cancer and the equator, so the sun's rays shine directly on the land.

▪ The summer monsoon comes from the southwest; the winds carry moisture from the Indian Ocean and bring heavy rain from June to September.

▪ **Moving Air and Lift:** Moving air can provide a lift. When we blow on top of a strip of paper:

▪ **Observation:** The paper is pushed up. To understand this, let us look at the forces acting on the strip of paper. Firstly, there is gravity which tends to pull it down. So, when you hold the paper near your mouth without blowing air, the paper will hang down due to gravity.

▪ However, when you blow the air above the paper, the pressure on top of a strip of paper is reduced. The pressure below the paper is greater than the pressure above it. This causes the pressure acting on the underside of the paper strip to push the pap up. Thus, moving air provides a 'lift'.

▪ **Why are roofs blown off in the wind?** The drop in pressure also explains why roofs, which are not very firmly fixed, are blown off when there is a very strong wind. When a strong wind blows, the pressure on top of the roof is lower than the pressure below, and as there is an imbalance of the two forces, the roof gets dislodged and is blown away.

▪ **Characteristics of wind**: Wind has two important characteristics-directions and speed .The direction of wind can be gauged using an instrument called the wind vane it is also called a weather vane. Every wind vane has two parts the front and the rear. For an accurate reading, the wind vane should be located well above the ground, beyond trees, and other buildings which may interfere with wind direction.

• The tip of the arrow is the front and the tail of the arrow is the rear.

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• When wind blows it presses more on the rear part of the wind vane as it has a greater surface area.
• the speed of wind is usually measured with an instrument called the anemometer
• Cup anemometers are mainly used by meteorological stations.
▪ The force exerted by the wind is greater on the inside surface of the cup than on the outside. Due to this, the cups rotate. The rate of rotation is directly proportional to the wind speed. The faster the wind speed, the faster the cups rotate. Cup anemometers are mainly used by meteorological stations
▪ Storms:
▪ Storms are severe atmospheric disturbances accompanied by very strong, high-speed winds; they are often set off when different types of air masses meet. This could be a dry air mass meeting moist air mass, or a cold air mass meeting a warm air mass. Storms can range from moderate to very severe.
▪ Severe storms can cause large-scale destruction of life and property. Such storms are given different names in different regions. They are called hurricanes in North America and the Caribbean, typhoons in Eastern Asia, and cyclones in India.

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