AIR

Air is present all around us. We cannot see it, but can feel it. It is necessary for living organisms. We cannot remain alive without breathing, even for a few minutes. Write in your notebook about activities which show the influence of air. Control of the temperature of the earth, falling of rain, dispersal of seeds are some activities, which cannot happen without air.Do try to make a list of such activities in your copy.

3.1 ATMOSPHERE

3

We have learnt that air is a mixture. Let us see what the main components of air are. Air has about 78% of nitrogen (N_2) , 21% of oxygen (O_2) , 0.9% of argon (Ar), 0.04% of water vapour, 0.03% of carbon dioxide and the rest is of sulphur dioxide and other gases and dust particles. Ozone layer is found above the earth surface at about 16 to 23 kilometre distance. Three atoms of oxygen combines to form one ozone molecule. This layer blocks the harmful ultra-violet rays. Thus the ozone layer helps in protecting us from skin cancer.

NOW ANSWER THESE

- 1. Air is a mixture of gases. What are they?
- 2. What is ozone layer? What is its importance?
- 3. Which are the gases, which have the maximum percentage in the air?

3.2 OXYGEN

We are all acquainted with the importance of oxygen in our life. It is a lifegiving gas. Come; we will look at its preparation, properties and uses.

3.2.1 METHOD OF PREPARATION

Activity 1

Materials required- Stand, heating apparatus, thick-glassed test tube, rubber tube, trough, two test tubes, cork, cotton and potassium-per-manganate.

Take about two to three gram of potassium-per-manganate in the thick-glassed test tube. As per fig 3.1, arrange the apparatus. Now heat the test tube

and collect the gas formed, in a test tube which is filled with water and kept inverted. To prepare this fill the test tube full with water. Now close the mouth of the test tube with your finger (fig 3.1 a) and make it stand inverted in a trough filled with water (fig 3.1b). See to it that the water does not spill out when you remove your thumb. Now when the test tube is filled with gas, let the gas escape. Let the test tube remain like that. We did not do any experiment with this gas because it contained some air along with the gas. Now collect the liberated gas in the test tube and put a cork on it. This collected gas is oxygen.



Potassium-per-manganate — potassium magnate + manganese dioxide + oxygen



Precautions - While preparing oxygen from potassium-per-manganate, a plug of cotton must be put in the hard-glass test tube and the test tube should be continuously shaken otherwise potassium permanganate may spring up into the test tube in which oxygen is being collected.

3.2.2 PHYSICAL PROPERTIES OF OXYGEN

Draw the table 3.1 in your copy and write the observations about the following properties of the oxygen gas collected in the activity 1.

TABLE 3.1 PROPERTIES OF OXYGEN		
S.N	Properties	Observations
1.	Physical state	
2.	Colour	
3.	Odour	
4.	Weight as compared to water	
5.	Solubility in water	less soluble

3.2.3 CHEMICAL PROPERTIES OF OXYGEN

Activity -2

Materials required - Test tube filled with oxygen, incense sticks, matchbox.

Take a test tube filled with oxygen. Light an incense stick with the matchstick. Take this incense stick near the mouth of the test tube filled with oxygen. (fig.3.2) and write the answers to the following questions in your copy.

- 1. Does oxygen burn by itself?
- 2. Does it help the incense stick to burn?

You see that when you bring the lighted incense stick near the test tube filled with oxygen, it starts burning vigorously. Therefore, we can say that oxygen does not burn itself but helps in burning.

Oxygen combines with metals and nonmetals to form oxides. You know that when magnesium wire is lighted in air, it burns with a bright light and gives a residue of white powder. This white powder is the oxide of magnesium.







Magnesium + Oxygen — Magnesium oxide

Activity 3

Materials required- A piece of coal, small spoon, heating apparatus and test tube filled with oxygen, limewater.

Heat a piece of coal in a small spoon until red-hot. Take this near a test tube filled with oxygen. What coloured flame do you observe?

Pour some limewater into the test tube. Does the limewater turn milky?

 $C + O_2 \longrightarrow CO_2$

Carbon + Oxygen — Carbon dioxide

Do the same activity with melted sulphur. When sulphur burns, the following reaction occur.



1. Respiration – The main use of oxygen is for respiration of plants and animals. Mountaineers, astronauts, scuba-divers carry these with them in suitable cylinders. In hospitals, asthma and heart patients and newborn babies having breathing difficulty are given oxygen masks.

2. Welding- Mixture of oxygen and some other gases are burned to get a flame used to join metal objects.

NOW ANSWER THESE

- 1. Explain the reaction, which takes place when potassium per magnate is heated?
- 2. What happens when red-hot coal is brought near a test tube filled with oxygen?
- 3. What are the uses of oxygen in our daily life?

3.3 USES OF NITROGEN

Have you ever thought, what would happen if there were only oxygen gas in the atmosphere? Would there be life? Presence of nitrogen in the atmosphere decreases the action of oxygen. Along with this, nitrogen is quite useful to us. Some of the uses of nitrogen are as follows:-

- 1. It is necessary for the growth of plants and animals.
- 2. A large amount of nitrogen reacts with hydrogen to form ammonia. Ammonia is used to make many fertilizers as urea.
- 3. Because of its inert nature, it is used in filling electric lamps to prevent oxidation of filament.
- 4. It is also used to keep stored food items fresh. Seal packed snacks as potato chips packets of uncooked and fried foods are filled with this gas. It does not allow the oxygen present in the air to come in contact.
- 5. Liquid Nitrogen is used as cooling agent in industry. Used for storing blood & organs for transplantation.

3.4 AIR POLLUTION

Air pollution means the presence of suspended particles and unwanted gases in such an amount that, their presence is harmful to man and other living organisms. Lets us see how our day-to-day activities can affect the air in our environment. Come, we will try to understand this.

Materials required- White paper, oil or vaseline.

Apply oil or vaseline on one side of the paper. Now leave this paper in open air. Take care that the oil or vaseline applied side is facing upwards (fig 3.3). After ten minute, compare this paper with a plane paper. Do you find any difference? Now you must have come to know, how polluted your neighbourhood is. Different students at different places can do the same activity, write your findings in table 3.2, and then compare your notes. You can also choose places other than what is given in table 3.2. In this way, you can know which place of your village or town is the most polluted.



Fig 3.3 Testing of air pollution

TABLE 3.2S.N. PLACE/LOCATION **OBSERVATIONS** Near fireplace 1. 2. At crossroads 3. Near factories 4. Near the window of your house

For getting information of pollution, there is another method also. For this, collect leaves from trees of different places as garden, road, school, industrial places, etc. Look at these leaves, see the dust on them and try to find the thickness of the dust on them. If you find any difference, try to find the cause.

Pollutants can be of any variety, they can be solids or gases. Solid particles are also called suspended particles. These particles are not only harmful to human health,

but also make the environment misty or dim. Some main causes of pollution are as follows-

- 1. Vehicles- Use of vehicles has increased day by day. Cars, buses, trucks, auto-rickshaws run on petrol or diesel, which are fuels obtained from biological reactions. Because of the burning of these fuels or mostly due to the incomplete combustion of these fuels, large amount of carbon-monooxide, oxides of nitrogen, lead are liberated into the atmosphere. These gases seriously injure human health, vegetation and other objects. Along with the increased number of vehicles in the cities, other causes, such as the engine of the vehicle, the technology used in the vehicle being new or old are also conclusive to the increase or decrease of air pollution.
- 2. Industrialization- The polluted solid particles coming out of the steel industry, cement factory, fertilizer industry have harmful effects not only on human health but also on living beings, vegetation and buildings. With the increase of population and expanding industries, the need for more energy has increased. For this many big projects have been started. The increased use of coal in these energy stations has increased air pollution. Along with this, large amount of ash is also thrown out of these stations, which covers a large area of the ground. Discuss other factors of air pollution in your class and note them in your copy.

3.4.1 MEASURES TO CONTROL AIR POLLUTION

For decreasing the air pollution, we must adopt pollution-controlling methods as-

- 1. Change the methods of manufacture such that less quantity of polluting materials is liberated.
- 2. For energy production, less polluting methods as solar energy and wind energy must be used more.
- 3. Check the vehicles for air pollution measures.
- 4. Burning of dry leaves, twigs of trees, paper, and waste products must not be done in the open but disposed of in a safe manner.
- 5. Plant more trees, they are the lungs of nature.
- 6. Increase the height of the chimneys of the factories so that polluting gases may not accumulate at lower levels.
- 7. Adopt habits, which encourage in controlling pollution.
- 8. Avoid smoking and encourage habits to avoid smoking.
- 9. Avoid or at least decrease the use of scents, air-fresheners, cosmetic sprays and such sprays.
- 10. Use petrol and diesel according to your need.

3.5 SMOG

Natural sources of air pollution are volcanic eruptions, forest fires etc. On the other hand smoke from the factories; thermal power stations; automobile exhausts and burning wood are the sources of pollutants produced due to human activities. Growing number of vehicles are continuously increasing the amount of pollutants like carbon-monoxide, carbon-dioxide, nitrogen oxide and smoke in the atmosphere.

During winters the oxides of nitrogen present in smoke mix with other air pollutants and fog to form a thick layer which is known as smog, which can cause respiratory diseases such as asthma, cough etc.

3.6 GREENHOUSE EFFECT

Usually earth absorbs the sunrays falling on it and acquires the needed heat energy. Out of this most of the light is reflected back. In this reflected rays, some infrared rays are also there. Some gases of the atmosphere absorb this infrared rays and stop them from going out of earth. Due to which the Earth surface remains hot.Carbon dioxide, carbon monooxide, methane, chloro-floro carbon, ozone are some gases which absorb infrared rays. These are known as green house gases. Stopping the infrared rays by



Fig.3.4 Greenhouse effect

these gases is what we call green house effect (fig.3.4). If these had not been there our earth would had been much colder as compared and may be, there would had been no life here also.

Now can you say what the effect would be on temperature of earth if the amount of greenhouse gases were increased due to pollution.

Greenhouse

In colder regions, plants are kept in glasshouses to keep them alive. Through the glass walls, sunlight reaches the plants, but this glass walls stops the reflected infrared rays to go out, due to which the temperature inside remains high and the required heat for the plants to live is attained. Such room made of glass for the plants is called the greenhouse (fig.3.5).



Fig.3.5 Greenhouse

3.7 ACID RAIN

In the atmosphere due to different causes sulphur and nitrogen oxides are formed. In addition, when it rains these oxides mixes with the rainwater and makes it more acidic. This is called acid rain. Nitric acid and sulphuric acid are mainly present in it.



Effects of acid rain -

- Due to acid rain, plant leaves turn yellow and fall off.
- Acid rain harms soil, water resources, forests, and human health.

• Acid rain pollutes water sources in such a way that many species of fishes are now becoming extinct. It is also harmful for human health.

• Acid rain corrodes buildings, statues specially made of stone or marble. For example, Taj mahal at Agra is being corroded.

NOW ANSWER THESE

- 1. What are the main gases that pollute the air?
- 2. What difference do you notice on the layers of deposits on the leaves of a neem tree on the roadside and one planted away? What is the effect of these on the biological processes of the plant?
- 3. Name the gases responsible for greenhouse effect?
- 4. Which are the gases mostly present in acid rain? How do they affect our lives?

3.8 ATMOSPHERIC PRESSURE

You have seen the cycle tube when filled with air swells up. Why does it happen? Come let us do an activity to understand this.

Activity -5

Materials required- Cycle pump, cycle tube, balloons.

First with the help of the cycle pump, fill air in the cycle tube and the balloon. You will find that both tube and the balloon have swelled up. Why is it so? The small particles present in the air collide with the walls of the balloon and the tube asserts pressure on it. Due to the pressure on the inner walls, they swell up. In this way, more air enters and they also apply pressure.

In the same way, the pressure applied by the atmosphere around us is called atmospheric pressure. When we move high above, the density of the air changes and due to it the atmospheric pressure also changes. As we go up in the air, the density decreases and so does the atmospheric pressure.

3.8.1 SOME EFFECTS OF ATMOSPHERIC PRESSURE

Atmospheric pressure has much effect on our body. Have you ever wondered when the atmospheric pressure is high, why we have not shrunk due to the atmospheric pressure? We and all living organisms are made of cells, which have such fluids in them, which exerts pressure from inside. The pressure exerted by the cells equals the atmospheric pressure. Now you must have understood why we have not shrunk.

What would happen if the pressure exerted from inside the cell were greater than the atmospheric pressure? Come let us perform an activity to understand this.



Materials required-An empty bottle of glucose, cork, two curved glass tubes, balloon.

First make holes in the corks and insert the glass tubes as shown in the figure. Place a balloon on the lower end of one tube (fig 3.6a). Now tighten the cork to the bottle and through the second tube suck out the air from the bottle. On doing this see how



it effects the balloon inside (fig3.6 b), you will find that the balloon slowly swells up. Sometimes it swells too much and bursts. This is because of the decreasing pressure inside the bottle. In the same way, when we go to a high altitude, the atmospheric pressure decreases, due to which our blood vessels swell up or sometimes burst.

When the atmospheric pressure of an area of the earth falls down suddenly then there may be storms and strong winds. Sometimes low atmospheric pressure can cause rains also.

3.8.2 MEASUREMENT OF ATMOSPHERIC PRESSURE

To measure atmospheric pressure, Torricelli in 1643 made an instrument, which is called barometer. This is of two types. 1. Mercuric Barometer, 2. Aneroid Barometer. Generally, the measure of atmospheric pressure is equal to 1.013 X 10⁵ Pascal or Newton/ Metre² or 76 cm of a column of mercury.

3.9 Do liquids exert equal pressure at same depth?



Materials required - An empty plastic bottle or a cylindrical container, water.

Make small holes at an equal height from the bottom of the bottle or container as shown in fig. 3.7 with the help of a nail. Now fill the bottle with water. Does the stream of water



coming out from each of the holes fall at the same distance Fig. 3.7 Liquid exerts from the bottle? This activity shows that liquid exerts equal equal pressure on the pressure on the walls of container at equal heights or depths. walls at equal depths.



NOW ANSWER THESE

- 1. What do you understand by atmospheric pressure?
- 2. What will happen to the human body if the air pressure of an area suddenly decreases?



WE HAVE LEARNT



- Mainly 78 % of nitrogen (N₂), 21 % of oxygen (O₂), 0.9 % of argon (Ar), 0.04% of water vapour, 0.03% of carbon dioxide and sulphur dioxide and dust particles are present in air.
- Ozone layer absorbs the harmful ultraviolet rays.
- Oxygen is heavier than air and lighter than water.

- Oxygen does not burn itself but helps in burning.
- Metals and nonmetals burn to form oxides.
- Nitrogen is used in the synthesis of ammonia, which is necessary for the production of fertilizers.
- The causes of air pollution are some human activities, burning of fossil fuels and factories.
- Air pollution is due to the presence of carbon monooxide, sulphur dioxide and oxides of nitrogen and suspended particles. The gases responsible for greenhouse effect are carbon monooxide, carbon dioxide, methane, ozone and oxide of chloro-floro carbon.
- There is nitric acid and sulphuric acid in acid rain.
- The pressure exerted by the air around us is called atmospheric pressure.
- Air pressure is measured by Mercuric or Aneroid barometer.
- Barometer was invented by Torricelli.
- Usually the atmospheric pressure equals 1.013 x 10⁵ Pascals or Newton/ metre² or 76 cm of mercury column.

QUESTIONS FOR PRACTICE

1. Choose the correct alternative-

- 1. Which gas has the highest percentage in air?
 - a) Oxygen b) Nitrogen c) Helium d) Carbon dioxide
- 2. Nitrogen is used in the storage of food items because
 - a) it provides oxygen to the food items
 - b) it provides carbon-dioxide to the food items
 - c) it provides protein to the food items
 - d) it keeps the food fresh.
- 3. Unit measure of atmospheric pressure is equal to the column of mercury pressure of -

a) 76 cm b) 76 mm c) 1.013 mm d) 10.13 mm

- 4. Oxygen gas as compared to water is
 - a) heavier b) lighter c) equal d) none of these
- 5. The cause of heating up of our atmosphere is
 - a) Ozone layer b) greenhouse effect
 - c) nitrogen d) oxygen

2. Fill in the blanks

- 1.gas helps in burning.
- 2. Of a nitrogen rich fertilizeris the main source.
- 3. The atmospheric pressureon going upwards from the earth surface.
- 4. Acid rain is due toandgases.
- 5. Oxygen isin water.
- 3. Find the correct sentences from these and rewrite the wrong sentences correctly.
 - 1. The percentage of oxygen in air is 10 percent.
 - 2. On heating potassium permanganate we get nitrogen gas.
 - 3. Sulphur dioxide when mixed with air, pollutes it.
 - 4. The air pressure in the balloon is due to the air filled in it, striking the walls of the balloon.
 - 5. Because of the inertness of nitrogen gas, it is filled in the electric bulbs.

4. Match the following.

Green house effect	Respiration
Oxygen	Keeping food items fresh.
Nitrogen	Nitric acid and Sulphuric acid
Acid rain	Carbon dioxide

5. Answer the following questions.

- 1. What are the components of air?
- 2. Explain with a well-labelled diagram the preparation of oxygen.
- 3. What are the causes of air pollution? What measures would you adopt to stop it?
- 4 What are the main uses of nitrogen gas?
- 5. What is acid rain? How is it harmful for us?

TRY TO DO THIS ALSO

- 1. Find out how many planets in the solar system has atmosphere in it.
- 2. Collect articles about green house effect from newspapers and magazines.
- 3. Will you propagate celebrating 'no crackers Diwali? Give reason to support your answer.
- 4. Name the following :
 - a. It is used as rocket fuel.
 - b. An ecofriendly gas that does not omit pollution .
 - c. The gas responsible for green house effect.
 - d. The gas that forms protective shield around earth.
 - e. Nitric acid & sulphuric acid with rain water.

