Air and Atmosphere

POINTS TO REMEMBER

1. Air cannot be seen as it is transparent we only feel its presence when it blows.
2. The thick layer of air around earth upto 320 km above the surface is called atmosphere.
3. Air is a mixture of various gases, water vapours, which protects us from harmful rays of Sun. It consists of nearly 80% nitrogen, 20% oxygen.
4. The components of air can be separated by simple physical means. Has no formula.
5. N_2 is inert gas, reduces the effect of O_2 present in air, N_2 is helpful in plant growth as it provides nitrates used by plant for formation of protein which is important nutrient for animals.
6. Oxygen is supporter of combustion no burning is possible without O_2 and no life is possible without it.
7. CO_2 is must for plant life, plants prepare their food taking CO_2 from air. CO_2 maintains temp, of earth and without CO_2 our planet would be too cold.
8. Ozone in the upper layers of atmosphere protects the earth from harmful ultraviolet rays of Sun.
9. Air is useful in many ways : Acts as medium for propagation of sound, birds, insects to fly in air, air ships, aeroplanes to fly only must due to presence of air. Air helps in movement of yachts, parachutes, aircrafts etc. Air is must for animals and plants on earth and air dissolved in water for aquatic life.
10. **Respiration :** Is a slow chemical process when O_2 present in the inhaled air reacts with the digested food material in the body to release energy, CO_2 and water. Sugar + Oxygen -> Carbon dioxide + Water + Energy.
    Breathing : The complete process in which air is inhaled and exhaled is called breathing.
11. **Combustion :** Burning of substance in air completely producing CO_2, heat and light.
12. **Photosynthesis :** Preparation of food by green plants taking CO_2 from air, water from soil in presence of sun light.
13. Oxygen in air remains constant it is not depleted as plants during day time produce lot of O_2 in air.
14. Soil contains air trapped in between its particle and organisms living there breath this oxygen. Due to this earth worms come out of soil during heavy rains as water gets into the pores in the soil.
15. Common pollutant of air are smoke, dust, coal, emitted by industries and automobiles.
16. Gases like SO_2, NO_2 also pollute air as they form corresponding acids when they come in contact with water vapours in air and fall down in the form of acid rain with rain water.
17. These pollutants reduce the visibility which lead to accidents, cause global warming.

EXERCISE-I

Question 1.
What is atmosphere ?
Answer:
The earth is surrounded by a thick layer of air called the atmosphere that extends upto a height of about 320 kilometres above the surface of the earth.

Question 2.
Why can't we see air ?
Answer:
We can't see air because it is colourless, odourless and transparent gaseous matter.

Question 3.
What is wind ?
Answer:
Fast moving air is called wind.

Question 4.
What would have happened if there would have been no atmosphere around the earth ?
Answer:
Without atmosphere life would not be possible as atmosphere protects us from harmful gases. We could not live without
air present in atmosphere. In absence of the atmopshere, the earth would get so cold at night that we would not be able to survive. No CO_2 and N_2 for plants without atmosphere.
P.Q. When water is heated, we see bubbles rising up. Why ?
Answer:
Water has a lot of air dissolved on it. This is what allows breathing to fishes and other aquatic beings. The solubility of gases decreases when the temperature is raised, and that is why the dissolved air bubbles out from the water.

Question 5.
Why is air called a mixture ? Give five facts in support of your answer.
Answer:
Air is a mixture because :

1. Air has no formula, a mixture has no formula whereas compound has a formula.
2. No energy changes are involved to form air from various gases.
3. When air is formed out of its constituents no change in mass and no change in volume takes place.
4. Properties of air vary from place to place and time to time. i.e. there is more CO_2 in towns as compared to villages where more oxygen prevails as compared to towns.
5. Components of air can be separated by simple physical methods.

Question 6.
What are the main components of air ? Write down the composition of three main gases present in air by volume.

Answer:

Main components of air are :

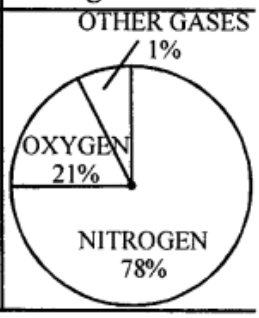
(*i*) Nitrogen (*ii*) Oxygen

Composition of air by volume :

Nitrogen	:	78%
Oxygen	:	21%
Carbondioxide	:	0.03 – 0.04%
Inert gases	:	0.9%
Water vapours	:	Variable
Dust particles	:	Variable
Other impurities	:	Variable

OR

Gases	Percentage	Figure
Nitrogen	78%	
Oxygen	21%	
Carbon dioxide	0.03 - 0.04%	
Inert gases	0.9%	
Water vapour	Varies	
Dust particles	Varies	
Other impurities	Varies	



Question 7.
What do you observe when

(a) Ice cold water is filled in a glass tumbler.
(b) A burning candle is covered with an inverted jar.
(c) Carbon dioxide gas is passed through lime water.
(d) A beam of light is allowed to enter in a closed dark room through a small hole.

Answer:

(a) We will observe that fine water droplets get deposited on the outer wall of the glass tumbler.
(b) The candle burn more brightly because candle gets oxygen support in burning.
(c) When CO_2 gas is passed through lime water it forms calcium carbonate which is white precipitate (turbidity). This gives the milky white appearance to the solution.

(d) We will observe randomly moving dust particles in the beam of light. This confirms the presence of dust particles in the air.

Question 8.
Write the chemical name of –

(a) Lime water
(b) The white insoluble solid formed on reaction of carbon dioxide with lime water.

Answer:

(a) Calcium hydroxide $Ca(OH)_2$
(b) Calcium carbonate – $CaCO_3$

These droplets were present in air as moisture which got condensed on the cooler walls of glass tumbler. This shows the presence of water vapours in air.

EXERCISE-II

Question 1.
Name two important processes supported by oxygen present in air.
Answer:
Two processes supported by oxygen present in air are :

1. Combustion
2. Respiration

Question 2.
Give two uses of the following components present in air:

(a) oxygen
(b) nitrogen
(c) carbon dioxide
(d) water vapour

Answer:

(a) Oxygen: For respiration and breathing no life is possible without oxygen. Oxygen is the most vital component which is responsible for two most important processes,
(i) Respiration and
(ii) Combustion.

(b) Nitrogen : Present in air gets fixed up in the soil as nitrates used by plants for their growth and for the formation of protein an important nutrient for animals. It is used to make fertilizers and various nitrogenous products.
(c) Carbon dioxide : Carbon dioxide is used by plants to prepare their food by photosynthesis. Dry ice (solid carbon-dioxide) is used as a refrigerant. Carbon dioxide is used to prepare fizzy drinks like soda water.
(d) Water vapour : Water vapors present in air provide moisture for both plants and animals. It also helps in predicting climatic conditions of a particular area as its amount varies from place to place and time to time.

Question 3.
Define the following:

(a) Respiration
(b) Photosynthesis
(c) Combustion.

Answer:

(a) Respiration : Respiration is a chemical process that takes place in all living beings (slow in plants). In this process, oxygen present in inhaled air reacts with the digested food material in the body. This results in release of energy, carbon-dioxide and water.
Sugar + Oxygen $\rightarrow$ CO_2 + Water + Energy.
(b) Photosynthesis : Process of producing food by green plants taking CO_2 from air, water from soil by roots and in presence of sun light and chlorophyll is called photosynthesis.
(c) Combustion : Combustion also called burning “is burning of substance in oxygen of air completely producing heat and light is called combustion.”

Question 4.
What are fuels ? Give two examples of modern fuels.
Answer:
Fuels : The substances which burn in air to produce large amount of energy in the form of heat and light are called fuels.
Examples :

1. CNG (Compressed natural gas)
2. LPG (Liquefied natural gas)

Question 5.
Give reasons :

(a) Aquatic animals and plants are able to survive in matter.
(b) A burning candle stops burning if covered with a glass tumbler.
(c) Mountaineers and divers carry oxygen cylinders with them.
(d) When water is heated, we see bubbles rising up.

Answer:

(a) Aquatic animals and plants use oxygen dissolved in water and survive.
(b) Oxygen is necessary for combustion when covered with a glass tumbler supply of oxygen stops.
(c) For artificial respiration mountaineers carry oxygen cylinders as at high altitudes, the air is thin and breathing becomes difficult. Also divers carry oxygen cylinder for artificial respiration as there is less oxygen dissolved in water (less dense) and breathing becomes difficult.
(d) These bubbles come from the air dissolved in water. The marine life uses air dissolved in water.

Question 6.
Name the processes which maintain the balance between oxygen and carbon dioxide in the air. How is it done?
Answer:
Respiration and combustion are the processes which maintain the balance between oxygen and CO_2 in the air.

1. **Respiration :** Respiration is a chemical process that takes place in all living beings. In this process, oxygen present in the inhaled air reacts with the digested food material in the body. This results in the release of energy, carbon dioxide and water.
2. **Combustion :** Burning or combustion is a process in which a substance reacts chemically with oxygen and gets oxidised, with the release of energy in the form of heat and light. It is a fast process. During the process of burning, along with energy, carbon dioxide and water vapour are also produced.

Question 7.
State two similarities and two differences between respiration and burning.
Answer:
Similarities:
Burning

1. Oxygen is needed to combine with carbon and hydrogen in compound.
2. CO_2 and H_2O are formed with release of energy.

Respiration

1. Oxygen is needed tocombine with C and H2 of food.
2. CO_2 and H_2O are formed with release of energy.

Differences :
Burning

1. It occurs at higher temperature.
2. Is fast process.
3. A natural and continous process.

Respiration

1. It occurs at body temperature.
2. Is slow process.
3. An artificial & discont inuous process.

Question 8.
Define rusting ? What are the two necessary conditions for rusting of iron. Give the chemical name of rust.
Answer:
Rusting : Slow conversion of iron into its hydrated oxide in the presence of moisture and air is called rusting.
Conditions for rusting:

1. Presence of moisture (water).
2. Presence of oxygen (air).

Chemical name of rust is hydrated iron oxide [Fe20rxH20]

Question 9.
How is air useful to :

(a) water boats
(b) agriculture
(c) windmills
(d) scooters and cars.

Answer:

(a) Air helps movement of water boats.
(b) Air speeds up drying up of agricultural products like grains, pulses fruits etc. Air helps in pollination of flowers and dispersel of seeds.
(c) Windmills work where there is sufficient movement of air.
(d) Air filled tyres of cars move smoothly on road as there is less friction.

Question 10.
State the full form of LPG and CNG ? How are the two different in their composition ?
Answer:
LPG (Liquefied Petroleum Gas): It is obtained from crude petroleum oil. It mainly contains gaseous compounds known as isobutane and butane. Popularly it is known as cooking gas. It is the best fuel for domestic purposes and in laboratories. It is available in cylinders. It is also supplied through pipes in big cities.
CNG (Compressed Natural Gas): It is produced along with crude oil. It mainly contains methane gas. It has become a popular fuel for vehicles like three wheeler scooters, cars and buses. It is a cheap fuel as well as pollution free. It is used as a substitute of petrol.
Difference in composition
LPG is obtained from crude petroleum oil. It mainly contains gaseous compounds known as isobutane and butane. While
CNG is produced along with crude oil. It mainly contains methane gas.

Question 11.

(a) Why is nitrogen important to all living beings ?
(b) What is nitrogen fixation ?

Answer:

(a) Nitrogen constitutes 78% of air by volume. It is of vital importance to the plants, animals and human beings as it is needed to prepare vital nutrient 'protein' to every living being which is necessary for their growth.
(b) Nitrogen cannot be absorbed directly by plants. It is first fixed up in the soil as nitrites and nitrates and then absorbed by the plants in soluble forms. This phenomenon is called nitrogen fixation.

EXERCISE-III

Question 1.
What is air pollution ?
Answer:
Air Pollution : "Mixing of UNWANTED and HARMFUL SUBSTANCES in air is called AIR POLLUTION."

Question 2.
Mention five causes of air pollution.
Answer:
CAUSES OF AIR POLLUTION ARE:

1. Burning of FOSSIL FUELS and FIBRES.

2. Cutting of forests.
3. Erruption of volcanoes.
4. Increase in POPULATION.
5. Agricultural activities like use of chemical fertilisers, insecticides, pesticides and burning of husks etc.

Question 3.
Name two air pollutants which

(a) affect our health
(b) cause acid rain
(c) cause global warming.

Answer:

(a) Two air pollutants that affect our health are :

1. DUST
2. SMOKE

(b) Two air pollutants that cause acid rain are :

1. SULPHUR DIOXIDE (SO_2) and
2. NITROGEN DIOXIDE (NO_2)

(c) Two air pollutants that cause global warming are :

1. CARBON DIOXIDE (CO_2)
2. METHANE (CH_4)

Question 4.
What is meant by ozone depletion?
Answer:
Ozone is present in the upper layer of atomosphere called stratosphere. It protects the earth from harmful ultraviolet rays of the sun.
Some air pollutants like chlorofluorocarbon (CFC) react with ozone present in the atmosphere. These pollutants reduce the density of the air. The ultra-violet rays from the sun reach directly on the earth which affect human health, causing skin diseases and cancer and also increase the earth's temperature.

Question 5.
State four steps to be taken to control air pollution.
Answer:
Four steps taken to control air pollution :

1. Tall chimneys be installed in factories and power houses so that smoke and gases rise high and get diluted.
2. GROW more tall trees to absorb CO_2 Also plants help in bringing rains.
3. Use unleaded petrol and CNG in all public transport vehicles
4. Industries should be located far away from residential areas.

Question 6.
Name three greenhouse gases.
Answer:
Carbon dioxide, methane, nitrous oxide, etc.

OBJECTIVE TYPE QUESTIONS

1. Fill in the blanks

(a) The layer of air around the earth is called the **atmosphere.**
(b) Although we cannot see air, we can **feel** it.
(c) Air is a **mixture** of gases.
(d) Plants and animals maintain the balance of carbon- **dioxide** and **oxygen** in air.
(e) Polluted air is harmful for health.
(f) The supporter of combustion in air is **oxygen.**
(g) Green plants need **CO_2 water and light** to prepare food.
(h) Oxygen is used in **burning** the food to get **energy.**
(i) Aquatic plants and animals use **dissolved oxygen** in water.
(j) The reddish brown powder on the surface of iron nails exposed to air and moisture is called **rust.**

2. Write 'true' or 'false for the following

(a) Air is a compound.
Answer. False
Correct: Air is a mixture.

(b) Carbon dioxide is given out during photosynthesis.
Answer. False
Correct : Oxygen is given out during photosynthesis.

(c) Respiration needs nitrogen.
Answer. False
Correct: Respiration needs oxygen.

(d) The composition of air was discovered by Lavoisier.
Answer. True

(e) The major component of air is oxygen.
Answer. False
Correct: The major component of air is nitrogen.

MULTIPLE CHOICE QUESTIONS

Tick (√) the correct alternative from the choice given for the following statements

1. Air consists of

1. only oxygen
2. only nitrogen
3. only carbon dioxide
4. **all of these**

2. Air pollution is due to the

1. cutting of green plants
2. gases like carbon monoxide, sulphur dioxide etc.
3. smoke given out by factories
4. **all of the above**

3. The gases which cause acid rain are

1. sulphur dioxide and oxygen
2. nitrogen and oxygen
3. carbon dioxide and water vapour
4. **nitrogen dioxide and sulphur dioxide**

4. Rust is

1. **hydrated iron oxide**
2. hydrated copper sulphate
3. anhydrous iron oxide
4. none of the above

5. Photosynthesis is a process in which plants

1. take in oxygen and give out carbon dioxide
2. **take in carbondioxide and give out oxygen**
3. take in nitrogen and give out oxygen .
4. none of the above.

6. Fuels which do not leave any residue on burning are

1. coal and wood
2. coal and LPG
3. wood and CNG
4. **LPG and CNG**

7. Respiration

1. is a slow process
2. is a natural and continuous process
3. takes place at body temperature
4. **all of the above**

8. Which of the following is common in combustion and respiration

1. **oxygen**
2. release of heat and light
3. natural process
4. nitrogen

9. Which of the following is not a green house gas ?

1. carbondioxide
2. sulphur dioxide
3. methane
4. **nitrogen**

10. The substance which accelerates the speed of a reaction without itself undergoing any change is called

1. **catalyst**
2. pollutant
3. fuel
4. none of the above.

ADDITIONAL QUESTIONS FOR PRACTICE
Exercise

Question 1.
State what do you understand by the term ‘air’. Explain its importance to mankind.

Answer:
Air is a mixture whose composition varies at different intervals of time and different places of the world.
Man cannot survive without air and water and hence air is very essential for survival.

Question 2.
Give a brief account of the discovery of air and the scientists involved.
Answer:
(i) John Mayow (1674) proved air has two components – active and inactive components.
(ii) Lavoisier (1789) named active component as oxygen and inactive component as nitrogen
(iii) Other scientists (1800's) discovered noble gases, CO_2, water vapours.

Question 3.
What is meant by the term 'atmosphere'. State the role played by the atmosphere for the survival of mankind.
Answer:
A blanket of air around earth is called atmosphere. Without atmosphere life would not be possible as atmosphere protects us from harmful gases. We could not live without air present in atmosphere. In absence of the atmopshere, the earth would get so cold at night that we would not be able to survive. No C02 and N2 for plants without atmosphere.

Question 4.
Explain in brief the different layers of the atmosphere and the basic functions of the main layers.
Answer:

Layers of atmosphere	Distance from earth (approximate)	Basic function
(i) Troposphere	0 to 10 kilometers	The troposphere

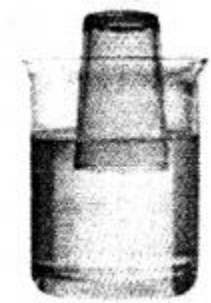
		contains most of the air and oxygen in the atmosphere. This air is fit for respiration and survival of living organisms. Weather conditions are formed in the troposphere.
(ii)Stratosphere	10 to 50 kilometers	The stratosphere contains the ozone layer which prevents the harmful effects of the sun (U.V. rays.) from reaching the earth.
(iii)Mesosphere	50 to 80 kilometers	The mesosphere is a very cold layer and most meteors burn up in this layer and hence are prevented from entering the earth's atmosphere.
Thermosphere	80 to 320 kilometers	—

Question 5.
Describe a simple experiment with the help of a diagram to show that

(a) Air occupies space
(b) Air has mass
(c) Air exerts pressure
(d) Air is highly compressible

Answer:

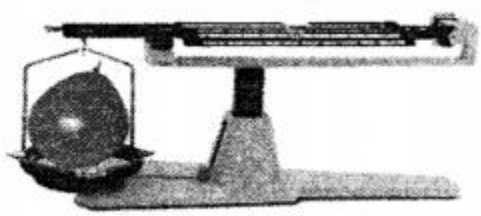
(a) Air occupies space —



- Press an inverted glass
- Tilt the tumbler to one side, tumbler over the water.

Observation : On tilting the tumbler, bubbles of air are seen coming out.
Water slowly enters the tumbler to take place of the trapped air in the tumbler.
Conclusion : Air occupies space (the space in the tumbler was occupied by air).

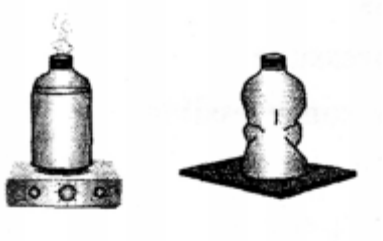
(b) Air has mass —



- An inflated balloon is placed on one side of the scale.

Observation : It is seen that the scale moves towards one side.
It moves on the side on which the inflated balloon was placed.
Conclusion : Air has mass.

(c) Air exerts pressure —



- Take an open can, fill it with water and heat it. On formation of steam, place the cap on tightly and keep the can aside.

Observation : On condensation of the steam the pressure inside the can reduces. The air outside, exerts pressure on the can which crumples slowly.
Conclusion : Air exerts pressure.

(d) Air is highly compressible —

- A leak proof syringe filled completely with air only (i.e. empty) is taken.

Observation : On pressing the piston of the syringe, the piston moves inwards. Air (gas) inside the syringe has maximum inter-molecular space and is highly compressible.
Conclusion : Air is highly compressible.

Question 6.
Name the components of air with their approximate percentage by volume in air. Does the percentage by volume of each component remain the same, in the atmosphere of different parts of the world. Explain with reasons.
Answer:
Main components of air are :

1. **Nitrogen**
2. **Oxygen**

Composition of air by volume :

Nitrogen ..... 78% or $\frac{4}{5}$ th

Oxygen ..... 21% or $\frac{1}{5}$ th

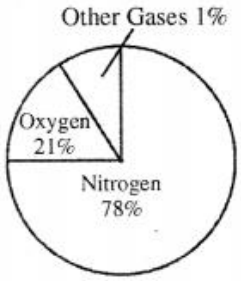
Carbon dioxide 0.03 – 0.04%

Inert gases 0.9%

Water vapours, Dust particles, Other impurities — Variable

OR

Gases	Percentage
Nitrogen	78%
Oxygen	21%
Carbon dioxide	0.03 - 0.04%
Inert gases	0.9%
Water vapour	Varies
Dust particles	Varies
Other impurities	Varies



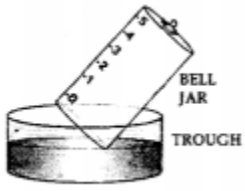
Air is a mixture whose composition varies at different intervals of time and different places of the world.

Question 7.

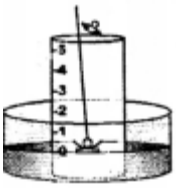
With the help of a labeled diagram, describe a simple experiment to show the presence of oxygen and nitrogen in air using a piece of white phosphorus.

Answer:

Activity to show the presence of oxygen and nitrogen in air using a piece of white phosphorous.

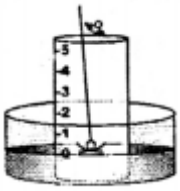


1. A trough is taken and filled with water.
2. Over it is placed a bell-jar marked with five equal parts.



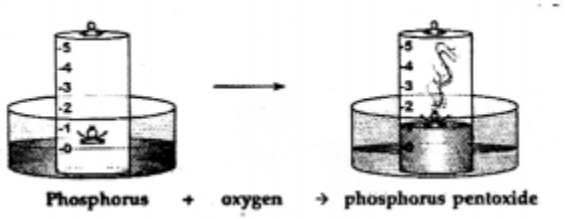
3. A crucible containing white phosphorus is placed on a cork.

4. The cork is made to float on the water.

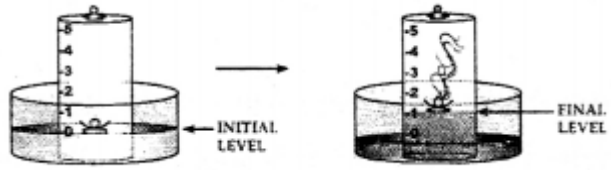


5. A heated iron rod is them taken.
6. The phosphorus is ignited with the heated rod.

Observation : Dense white fumes of phosphorus pentoxide (P_2O_5) are formed when the phosphorus (P) burns in the active component of air (oxygen).



The rise in the level of water in the bell-jar is by – 1/5



Conclusion :

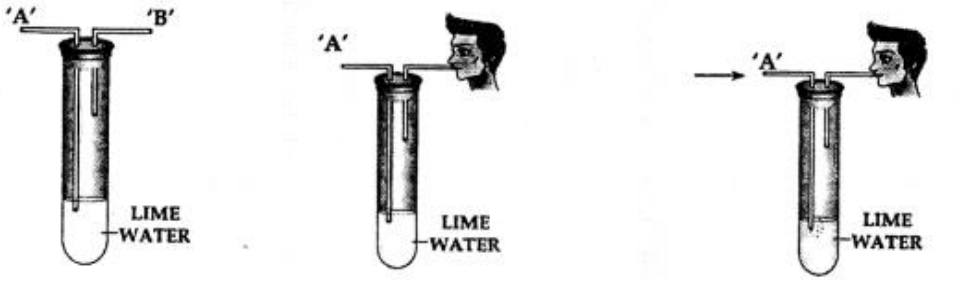
Oxygen Active compound	**1/5** (approx. vol.)	Supports combustion	Used up in burning
Nitrogen In Active component bell-jar	**4/5** (approx. vol.)	Does not support	Remains behind in the combustion

The active component of air i.e. oxygen (1/5 of air) is used up in burning.
The remaining inactive component of air i.e. nitrogen (4/ 5 of air) is not used up in burning.

Question 8.
You are given a test tube with two outlets and a bottle of lime water. Usint same, how would you demonstrate experimentally the presence of carbon dioxide in air.

Answer:
Procedure

1. Take lime water in a test tube with two outlets ‘A’ and ‘B’ as shown above.
2. Air is sucked slowly through the outlet ‘B’.
3. Air moves in through end ‘A’ and passes through the lime water.



Observation: The line water in the test tube turns milky.
Conclusion: Air which is sucked in from and ‘A’ contains carbon dioxide which turns the lime water milky. Hence, air contains – carbon dioxide.

Question 9.
Give a reason why water droplets appear on the outer surface of a tumbler containing ice.
Answer:
Water vapour present in air, condenses on the cooler surface of the tumbler. Hence they condenses into tiny water droplets.

Question 10.
Explain the importance of nitrogen of the air for plant growth.
Answer:
Nitrogen of air is converted to soluble nitrogenous compounds in the soil in the presence of air and moisture. These are absorbed by plants and converted to plant proteins.

Question 11.
Give a reason why nitrogen is filled in food packets and not oxygen.
Answer:
Nitrogen being inert or unreactive is filled into food packets to drive out the oxygen and reduce bacterial growth. The food package then stays well preserved.

Question 12.
State what would happen, if the air above the earth contained mainly oxygen and no nitrogen.
Answer:
Nitrogen is utilised by plants for their growth and development.

Free nitrogen of the air is converted to nitrogen compounds which are absorbed by the plants and converted to plant proteins. In the absence of nitrogen no plants will be survived on the earth.

Question 13.
State the utility of oxygen for respiration in

(a) living organisms
(b) plants.

Answer:
(a) Respiration in living organisms :

Respiration— It is a process whereby living things

1. Use oxygen from their air to oxidize food substances mainly glucose, in their body cells.
2. Release energy in the form of heat.
3. Carbon dioxide and water vapour are also produced and released in the exhaled air.

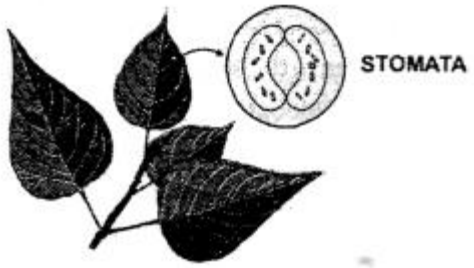
$$\underset{\text{[in air]}}{\text{Glucose} + \text{Oxygen}} \rightarrow \underbrace{\underset{\text{dioxide}}{\text{Carbon}} + \underset{\text{vapour}}{\text{Water}}}_{\text{Exhaled air}} + \underset{\text{[heat]}}{\text{Energy}}$$

Process—

1. **Inhaled air—** Oxygen from inhaled air dissolves in the blood stream in the lungs. It is carried to the cells where the food materials i.e. glucose is oxidized by the oxygen.
2. **Exhaled air—** Carbon dioxide, water vapour and heat energy diffuse out of the lungs as exhaled air.
3. **Energy liberated—** The energy liberated is utilized for metabolic activities and maintains the body temperature.

(b) Respiration in plants :

1. Plants respire during the day and night.
2. Plants— Respire through tiny pores on the surface of the leaves called ‘stomata’.
3. The stomata help in taking in oxygen of the air and giving out carbon dioxide. Thus, they function as respiratory organs.
4. Plants do not perform bodily activities and hence need less energy than animals. The rate of respiration in plants is thereby slower than in animals.



Photosynthesis in plants:
Photosynthesis is a process by which green plants prepare their own food in the presence of sunlight and chlorophyll.

1. In the leaf of a green plant are present leaf cells which contain chloroplasts in which is present a green pigment called chlorophyll.
2. During photosynthesis which occurs during daytime, carbon dioxide and water in the presence sunlight and chlorophyll is changed into glucose and oxygen is released out.

$$\text{Carbon dioxide} + \text{Water} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{Glucose} + \text{Oxygen} + \text{Water}$$

3. Hence oxygen in the air is renewed by photosynthesis and therefore the amount of oxygen in air does not get depleted or removed from air.

Question 14.
Compare respiration and combustion-both involving oxygen of the air.
Answer:
Respiration is a process whereby living organisms

1. Use oxygen from the air to oxidize food substances mainly glucose, in their body cells.
2. Release energy in the form of heat.
3. Carbon dioxide and water vapour are also produced and released in the exhaled air.

$$\underset{}{\text{Glucose}} + \underset{\text{(in air)}}{\text{Oxygen}} \longrightarrow \underset{\text{dioxide}}{\text{Carbon}} + \underset{\text{vapour}}{\text{Water}} + \underset{\text{(heat)}}{\text{Energy}}$$

Exhaled air

Combustion or burning, involves oxidation i.e. combination of substances like fuels with oxygen or air generally resulting in production of heat and light.

Fuel	+	Oxygen (in air)	⟶	Carbon dioxide	+	Water vapour	+	Energy (heat and light)

Carbon dioxide is released into the air as a result of all burning.

Question 15.
Explain the importance of carbon dioxide for
(a) photosynthesis **(b)** warming the earth's environment. State what would happen if excess carbon dioxide as a pollutant is released into the atmosphere.
Answer:
(a) During photosynthesis which occurs during daytime, carbon dioxide and water in the presence of sunlight and chlorophyll is changed into carbohydrates and oxygen is released out.

$$\underset{\text{(in air)}}{\text{Carbon dioxide}} + \text{Water} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \underset{\text{(glucose)}}{\text{Carbohydrates}} + \text{Oxygen}$$

Hence oxygen in the air is renewed by photosynthesis and therefore the amount of oxygen in air does not get depleted or removed from air.
(b) Infrared (I.R.), visible rays and ultra violet (U.V.) rays are present in the earth's surface.
The reflected U.V. rays from the earth's surface pass through the carbon dioxide in the atmosphere, but the I. R. rays are prevented by the carbon dioxide from being radiated out of the earth's surface. This results in the earth's environment staying warm.
The thick C02 layer prevents the heat radiations from being radiated out which reason :
Reason : It results into rise in global temperature.

Question 16.
State in brief how water vapour in the atmosphere determines the climatic conditions.
Answer:
Water vapour in the atmosphere in excess :

(a) Minimizes the rate of evaporation.
(b) Produces rain, mist etc. thereby determining climatic conditions.

The rain serves as a natural source of water for plants and animals.

Question 17.
Give a reason why two different rare (inert) gases find application in advertisement signs and fluorescent bulbs.
Answer:

1. Neon – In neon sign advertisements A brilliant red glow is seen on passage of an electric current through neon gas at low pressure. The colour can be changed by mixing mercury vapour and argon with neon.
2. Xenon – In fluorescent bulbs flash bulbs and lasers. It emits intense white light in discharge tubes.

Question 18.
A mixture has a variable composition. Give three other reasons why air is considered a mixture and not a compound.
Answer:
Air is a mixture because :

1. Air has no formula, a mixture has no formula whereas compound has a formula.
2. No energy changes are involved to form air from various gases.
3. When air is formed out of its constituents no change in mass nor change in volume takes place.
4. Properties of air vary from place to place and time to time. i.e. there is more CO_2 in towns as compared to villages where more oxygen prevales as compared to towns.
5. Components of air can be separated by simple physical methods.

Question 19.
State a reason why there is a balance in the amount of carbon dioxide in the air, even though carbon dioxide is released into the atmopshere by various processes.
Answer:
By the way of photosynthesis in plants which which occurs during daytime, carbon dioxide and water in the presence of sunlight and chlorophyll is changed into carbohydrates and oxygen is released out.

$$\text{Carbon dioxide} + \text{Water} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{Carbohydrates} + \text{Oxygen}$$

(in air) (glucose)

Hence, oxygen in the air is renewed by photosynthesis and therefore the amount of oxygen in air does not get depleted or removed from air.

Question 20.
Name three different appliances where air is utilized.
Answer:

1. Vehicles – Run on tyres which are inflated with air.
2. Brake mechanisms – Of trains and other machines, work on compressed air.
3. Pumps and siphons – Work on air pressure.

Objective Type Questions

Air and Atmosphere

Q.I. Match the statements in List I with the correct answers in List II.

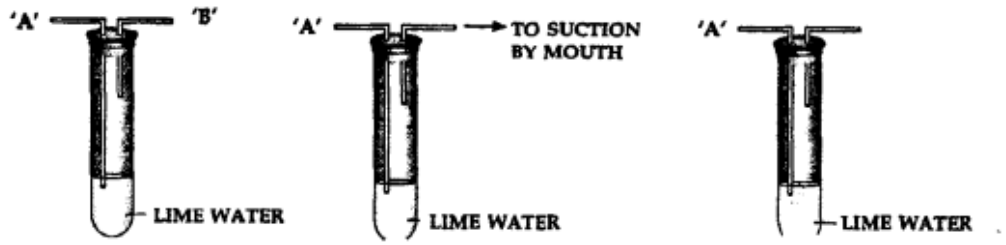
List I	List II
1. An impurity in air	A : Water vapour
2. The component of air which supports combustion	B : Respiration
3. The inert component in air, slightly soluble in water	C : Rare gases
4. The component of air which minimizes the rate of evaporation	D : Sulphur dioxide
5. The process which involves oxidation of food substance in living organisms	E : Helium
6. The component of air which finds application in observation balloons	F : Carbon dioxide
7. The process which involves oxidation of substances, liberating heat and light energy	G : Combustion
8. The component of air which is heavier than air and fairly soluble in water	H : Nitrogen
9. The process by which atmospheric carbon dioxide is absorbed by plants resulting in formation of carbohydrates	I : Photosynthesis

10. The component of air, which is lighter than air and less than 1% in air **J: Oxygen**

Ans.

List I	List II
1. An impurity in air	D : Sulphur dioxide
2. The component of air which supports combustion	J : Oxygen
3. The inert component in air, slightly soluble in water	H : Nitrogen
4. The component of air which minimizes the rate of evaporation	A : Water vapour
5. The process which involves oxidation of food substance in living organisms	B : Respiration
6. The component of air which finds application in observation balloons	E : Helium
7. The process which involves oxidation of substances, liberating heat and light energy	G : Combustion
8. The component of air which is heavier than air and fairly soluble in water	F : Carbon dioxide
9. The process by which atmospheric carbon dioxide is absorbed by plants resulting in formation of carbohydrates	I : Photosynthesis
10. The component of air, which is lighter than air and less than 1% in air	C : Rare gases

Q.2. The diagrams below represents an experiment to show the presence of a – component of air.



Question 1.
State why air is sucked from – outlet 'B' and not from outlet "A".
Answer:
Because if we suck from 'A', lime water will be sucked out.

Question 2.
State why the air is sucked 'slowly' from the outlet "B"
Answer:
Because if air is sucked fast, lime water will also be sucked out.

Question 3.
State the observation seen after completion of the experiment.
Answer:
Lime water turns milky.

Question 4.
State the reason for the above observation seen.
Answer:
The reason is the formation of CO_2.

Question 5.
Name another component which if present in air as a pollutant – would have given a similar observation.
Answer:
Sulphur dioxide.

Q.3. Complete the statements given below by filling in the blanks with the correct word/s from the word/s in bracket.

1. The **stratosphere** is a layer which extends upto about 10-50 kms. above the earth.
2. Hydrogen sulphide is an example of a pollutant present in air.
3. The component of air used in photosynthesis is **carbon dioxide** and the products of photosynthesis is **oxygen.**

4. The product formed which is common to both combustion and respiration is **nitrogen dioxide.**
5. The component of air which is variable in air above sea level and in air in general **water vapour.**

Q.4. Name the following

Question 1.
The product formed when phosphorus burns in oxygen.
Answer:
Phosphorus pentoxide (P_2O_5).

Question 2.
The layer of atmosphere which contains the ozone layer.
Answer:
Stratosphere.

Question 3.
The active component of air which supports combustion and is used up in burning.
Answer:
Oxygen.

Question 4.
The main, rare (inert) gas present in air.
Answer:
Argon.

Question 5.
The component of air which is present more in industrial areas.
Answer:
Carbon monoxide, sulphur dioxide, oxides of nitrogen, hydrogen sulphide, dust particles.

Question 6.
The type of bacteria which directly absorb nitrogen from the air and converted soluble nitrates in the soil.
Answer:
Symbiotic bacteria.

Question 7.
The product of respiration released in exhaled air, other than carbon dioxide.
Answer:
Water vapour and energy.

Question 8.
An inert gas which has a low boiling point and is used for producing very low temperatures.
Answer:
Helium.

Question 9.
A process which removes carbon dioxide from the air.
Answer:
Photosynthesis.

Question 10.
The component of air which does not support combustion.
Answer:
Nitrogen.

Q.5. State whether the following statements are 'true' or 'false'. If false write the correct statement.

1. The mesosphere in the atmosphere, contains most of the air, fit for respiration.
Answer. False.
Correct : The troposphere in the atmosphere, contains most of the air, fit for respiration.

2. The percentage of carbon dioxide in the air is between 0.2 to 0.4%.
Answer. True.

3. Carbon dioxide, water vapour and energy in the form of heat are evolved during respiration.
Answer. True.

4. Photosynthesis is a process by which green plants prepare their own food in the presence of sunlight and chlorophyll.
Answer. True.

5. Air is a mixture and not a compound since the components of air cannot be separated by physical methods.
Answer. False
Correct : Air is a mixture and not a compound since the components of air – can be separated by physical methods.

Q.6. Give word equations for the following conversions.

Question 1.
Nitrogen of the air to nitric oxide.
Answer:

$$\text{Nitrogen} + \text{Oxygen} \rightarrow \text{Nitric oxide}$$

The nitric oxide reacts with oxygen to give nitrogen dioxide.

Question 2.
Nitric oxide to nitrogen dioxide.
Answer:
Nitric oxide + Oxygen → Nitrogen dioxide
The nitrogen dioxide further reacts with oxygen and water vapour of the air to give nitric acid.

Question 3.
Nitrogen dioxide to nitric acid.
Answer:
Nitrogen dioxide + Oxygen + Water → Nitric acid
The nitric acid formed comes down with the rain and combines with the carbonates in the soil to form soluble nitrates.

Question 4.
Nitric acid to soluble nitrates in the soil.
Answer:
Calcium carbonate + Nitric acid → Calcium nitrate + water + carbon dioxide
The water soluble calcium nitrates are absorbed by the plants and converted to plant proteins.

Question 5.
Carbon dioxide in air to carbohydrates in plants.
Answer:

$$\underset{\text{(in air)}}{\text{Carbon dioxide}} + \text{Water} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \underset{\text{(glucose)}}{\text{Carbohydrates}} + \text{Oxygen}$$

Carbon dioxide and water in the presence of sunlight and chlorophyll is changed into carbohydrated and oxygen is released out.