Chapter – 15: Air Around Us

- Air – mixture of several gases – present everywhere around us
- All living things – require air – breathing and survival
- Air present in soil and water as well
- Cannot see air – BUT – feel its presence – moving air – wind
- Wind – stirs the leaves of plants and trees – sails yacht (sailing boat)
- High speed winds – even blows off tin roofs of houses
- Children – play with *phirki* – adjust direction of *phirki* blade according to wind's direction – *phirki* rotates
- Weathercock – device – shows direction of wind
    - Broad blade – shape of cock – fixed on an arrow
    - This blade – attached to rotating axis
    - Wind – pushes the blade – cock and arrow – align in the direction of air
- Air – gaseous – compressed easily
- Properties –
    - Colourless, tasteless, odourless gas
    - Has some mass (weight)
    - Occupies space
    - Dissolves in water
    - Can be compressed

Air is present everywhere around us

- Present everywhere – cannot be seen
- Containers – appear empty – BUT – filled with air
- Empty bottle – turn upside down – still air inside it
- Activity –
    - Take an empty bottle – turn it upside down
    - Dip it in some water – water does not enter the bottle
    - Tilt the bottle – air bubbles formed inside water
- This activity confirms – air is present everywhere

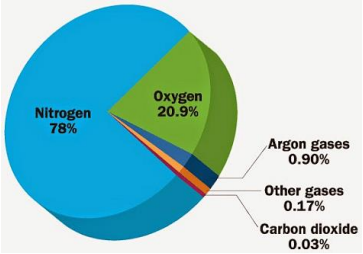
Atmosphere

- Earth – surrounded by layer (envelope) of air – atmosphere
- Extends upto many kilometres – above the surface
- Essential for life
- Air – provides oxygen – required for breathing
- As you go higher – air becomes thinner (less amounts)
- High mountains – less air – less oxygen – mountaineers (people – climb mountains) – carry oxygen cylinders

Composition of Air

- For a long time – people believed – air – single gas
- Through experiments – it is proved – air – mixture of many gases

- Major component – nitrogen gas – 4/5th part
- Second major component – oxygen gas – 1/5th part
- Other components – carbon dioxide, water vapour, other gases (argon, helium, etc)
- Also contain – dust particles
- Composition in terms of percentage –
    - Nitrogen – 78 %
    - Oxygen – 21 %
    - Carbon dioxide, water vapour, other gases, dust particles – 1 %
- This composition – not same everywhere – varies – place to place, season to season



- Air over industries – higher amounts of Carbon Dioxide
- Air over open spaces – higher amounts of Oxygen
- Windy places – higher amounts of dust
- Activity –
    - Take a vessel – fill it with water – add some caustic soda and ink
    - Place a glass jar inside – fix a candle over it
    - Light the candle – place an empty glass jar over it
    - After some time – candle stops burning – water rises inside the jar
- This activity – confirms – air – mixture of gases
- When all the oxygen – used up during burning – candle is extinguished (stops burning)
- Water rises inside jar – oxygen used up – fill the empty space

Nitrogen

- Colourless, tasteless, odourless gas
- Slightly soluble in water
- Not required for breathing
- Does not support combustion (burning)
- Very unreactive gas
- Imp. for living things – nitrogen compounds required for growth
- Nitrogen in air – used by plants – make proteins – required for growth

Oxygen

- Colourless, tasteless, odourless gas
- Slightly soluble in water
- Required for breathing – all living things require oxygen
- Support combustion (burning) – BUT – does not burn itself

Necessary for living things

- All living things – plants and animals – use oxygen – respiration
- Respiration – oxygen breaks down food – give out carbon dioxide, water and energy
- Land organisms – take oxygen from air
- Water organisms – take oxygen dissolved in water

- Ordinary conditions – breathe in oxygen from air – special conditions – breathe in oxygen from oxygen cylinders
    - Patient with breathing difficulties (asthma, etc), mountaineer climbing a high mountain, diver going into deep sea

Necessary for burning (combustion)

- Burning of a substance – combustion
- Oxygen in air – necessary for burning
- Continuous burning – continuous supply of air (oxygen) is required
- Burn some coal – cover it with a vessel – stops burning after some time
- Clothes of some person – catches fire – cover them with a blanket – clothes stop burning

Carbon Dioxide

- Colourless, odourless gas – slightly sour in taste
- Moderately soluble in water
- Does not support burning
- Puts out burning fire – cuts off supply of oxygen
- All living things – consume oxygen – produce carbon dioxide
- Present in small amounts – BUT – imp. for green plants – produce food – photosynthesis
- Water plants – use carbon dioxide dissolved in water

Water Vapour

- Air – also contains water vapour – cannot see it – present in form of gas
- Air – comes in contact with a cold surface – water vapour – condenses – form tiny droplets around the cold surface
- Produced during evaporation and transpiration
- Presence of water vapour – imp. for water cycle

Dust Particles

- Always present in air
- Activity –
    - Darken a room – put black charts on windows – curtains on doors
    - Make a small hole in the chart – facing the sun
    - Thin beam of light – enters the room
    - Dust particles – easily observable in the light
- Various sources of dust particles –
    - Traffic, dusting at home, construction activities
- Amount of dust – varies – place to place, time to time
- Our nose – contains hair and mucus – filter out dust particle – NEVER breathe through mouth

Smoke

- Smoke – also present in air

- Consists of carbon particles and other gases
- Produced on burning of fuels – wood, coal, kerosene, etc
- Always harmful – breathing – damages our health
- Chimneys in factories – release smoke high up in the air – no effects of smoke on ground
- Traffic policemen – wear masks – protect themselves from harmful smoke

How is oxygen available for animals and plants living in soil?

- Animals living in soil – plant roots inside soil – need oxygen – breathing
- Air present between soil particles – contain oxygen
- Activity –
    - Take a beaker – fill some soil in it – pour some water over it
    - Stir the soil – air inside it – filled with water
    - Bubbles can be seen in the water – release of air
- Heavy rains – space between soil particles – filled with water – all animals come out
- Many animals – dig burrows and holes – makes space for air in soil
- Plant roots – also receive oxygen from these spaces between soil

How is oxygen available for animals and plants living in water?

- Aquatic animals and plants – use oxygen dissolved in water
- Activity –
    - Take a beaker – fill it with water
    - Heat the water slowly – using a burner – bubbles can be observed
    - On heating – solubility of air decreases – comes out in the form of bubbles

How is oxygen in air (atmosphere) replaced?

- Oxygen in air – used by plants and animals AND burning of fuels
- This oxygen – replaced by plants through photosynthesis
- During photosynthesis – carbon dioxide used up – oxygen released into air
- Used up carbon dioxide – replaced by animals and plants – during respiration (breathing)
- Plants and animals – help in maintaining – oxygen and carbon dioxide levels in the air

Uses of air

- Plants and animals – use for breathing
- Burning fuels – wood, coal, etc – make fire
    - Fire – used for many purposes – cooking food, heating, etc
- Filled in tyres – different vehicles – bicycles, scooters, cars, etc
    - Inflated (air-filled) tyres – make transport smoother, easier
- Helps in disposal of seeds and pollen grains
- Wind – moving air – turn the blades of windmill
    - Wind mills – used to fetch water, run flour mills, generate electricity
- Helps in moving yachts (sailing boats), parachutes, gliders, etc
- Helps the birds, bats, etc in flying
    - These organisms – can fly only due the presence of air
- Imp. role in water cycle
    - Hot air – lighter – rises up and carries water vapour with it – also carries clouds with it