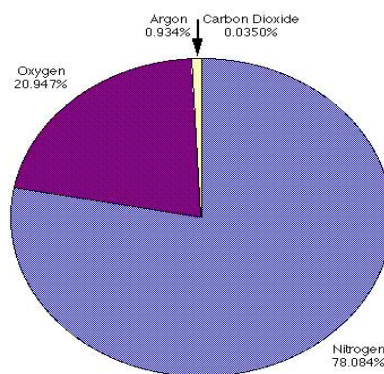


## SCIENCE FORM 1

### CHAPTER 5 THE AIR AROUND US

- Air is the mixture of matters in gaseous form  
[Matter: has mass and occupies space]
- The atmosphere is the layer of air that surrounds the Earth
- Air is a mixture of different gaseous. Main composition of air
  - o Nitrogen & oxygen
  - o Rare gases (inert gases): helium, neon, argon, krypton and xenon
  - o Carbon dioxide, water vapour, dust [from burning fuels] and microorganisms [causing diseases]



- The most abundant gases found in our atmosphere are nitrogen and oxygen.
- Nitrogen makes up around 78% of the total atmosphere, while oxygen makes up 21%. The remaining 1% is made up mostly of a gas called argon.
- This means that with each breath you take you are breathing 78% nitrogen, 21% oxygen and 1% argon, with trace amounts of other gases, such as methane, hydrogen, helium, neon, krypton, carbon dioxide, and a form of oxygen known as ozone.
- Gases That Affect Our Weather
- Most of the gases in our atmosphere have little to no effect on our weather patterns. However, a few gases have a significant effect on the weather that we experience around the world.
- Carbon dioxide is one of these gases. The gas known as carbon dioxide has the unique characteristic of absorbing infrared radiation, or the heat sent to the Earth by the Sun.
- This helps to insulate the Earth, and to keep the lower atmosphere warm enough for life to exist.
- What will happen if carbon dioxide levels become too high? This is unknown, but many scientists believe that there is a possibility that the Earth's temperature will rise, causing many unpredictable effects.
- The component of air can be separated physically by heating cold-compact air in a fractional distillation furnace

## Properties of Oxygen and Carbon Dioxide

Properties	Oxygen	Carbon Dioxide
State at room temperature	Gas	Gas
Color	Colorless	Colorless
Smell	Odourless	Odourless
Solubility in water	Slightly soluble	Slightly more soluble than oxygen
Density	Same density as air	Denser than air
Reaction with sodium hydroxide	Not soluble	Very soluble
Effects on glowing splinter	Relights glowing splinter	Extinguishes a glowing splinter
Effects on burning splinter	Burning splinter burns brightly	Burning splinter extinguishes
Effects on litmus paper	No change	Blue litmus paper turns red
Effects on lime water	No change	Turns cloudy
Effects on hydrogen carbonate indicator	No change	Red indicator turns yellow

## Importance of Oxygen

I. **Respiration**, a process by which our body obtain and uses oxygen to oxidise for the production of energy.

### Inhalation and Exhalation

- inhale air: air breathed into the body
- exhale air: air breathed out of the body

### Component of inhaled air and exhaled air

c	Composition	
	Inhaled air	Exhaled air
Nitrogen	78	78
Oxygen	21	16
Carbon dioxide	0.03	4
Inert gases	0.97	0.97
Water vapour	less	More
Temperature*	low	high

### Respiration process

Food + Oxygen → Energy + Carbon Dioxide + Water vapour

**II. Combustion**, a process whereby fuel burning in oxygen gives out heat and light energy  
- in the principle of combustion, combustion only takes place in the presence of oxygen, fuel and heat[ combustion will not take place if anyone is not fulfilled]  
- products of combustion

- Fuels burnt to produce energy
  - Carbon fuels: contain carbon atoms only. Eg. Coal, charcoal and firewood
    - produces carbon dioxide, heat and light energy

Carbon + Oxygen - > Carbon Dioxide + Heat Energy + Light Energy

- Hydrocarbon fuels: compound hydrogen and carbon. Eg. Petrol, kerosene and candles
  - produces carbon dioxide, water vapour, heat and light energy

Hydrocarbon + Oxygen -> Carbon dioxide + Water Vapour + Heat

Energy + Light Energy

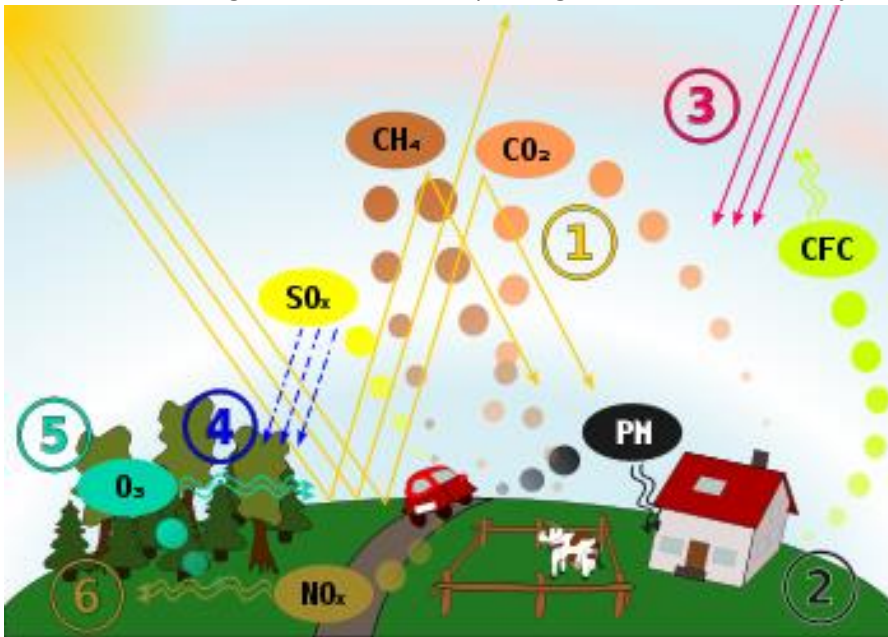
### Air Pollution

- air pollutants include harmful solid particles and poisonous gases in the air.

Major primary pollutants produced by human activity include:

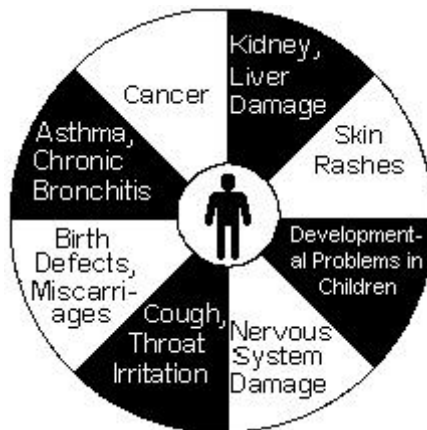
- **Sulphur oxides** (SO<sub>x</sub>)
  - SO<sub>2</sub> is produced by volcanoes and in various industrial processes
  - Further oxidation of SO<sub>2</sub>, usually in the presence of a catalyst such as NO<sub>2</sub>, forms H<sub>2</sub>SO<sub>4</sub>, and thus **acid rain**.
- **Nitrogen oxides** (NO<sub>x</sub>)
  - expelled from high temperature combustion, and are also produced during **thunderstorms** by **electric discharge**
  - One of the most prominent air pollutants, this reddish-brown toxic gas has a characteristic sharp, biting odor.
- **Carbon monoxide** (CO)
  - product by **incomplete combustion** of fuel such as natural gas, coal or wood. Vehicular exhaust is a major source of carbon monoxide.
- **Chlorofluorocarbons** (CFCs)
  - These are gases which are released from air conditioners, refrigerators, aerosol sprays, etc. CFC's on being released into the air rises to **stratosphere**. Here they come in contact with other gases and damage the **ozone layer**.
  - This allows harmful ultraviolet rays to reach the earth's surface. This can lead to skin cancer, disease to eye and can even cause damage to plants.
- **Radioactive pollutants**
  - produced by **nuclear explosions**, nuclear events, war **explosives**, and natural processes such as the **radioactive decay** of **radon**.
- Nicotine, tar, tobacco
  - Carcinogenic substances from cigarette smoke

- Nicotine causes membranes of respiratory system to produce mucus, and clog the airway induce coughing
- Tar damages the cilia of air passage and blocks the tiny air passages leading to alveolo



- (1) greenhouse effect
- (2) particulate contamination
- (3) increased UV radiation
- (4) acid rain
- (5) increased ground level ozone concentration
- (6) increased levels of nitrogen oxides.

## Effects of air pollution on human beings and their surroundings



### i. Human Health

- Lead: toxic and cause mental disability in children and babies
- Carbon monoxide: reduce oxygen that blood carry
- Radioactive rays: cause cancer
- smoke –filled air: breathing difficulties
- sulphur dioxide: breathing difficulties & bronchitis
- nitrogen oxide: cause itchy eye and affects respiratory system

## ii. Building

- cause acid rain corrodes concrete and limestone buildings

## iii. Plants

- acid rain cause soil become less fertile
- smoke and haze restrict photosynthesis , closing stomata
- smog and haze reduce light rays

## iv. world climate

- excessive carbon dioxide causing greenhouse effect and global warming
- chlorofluorocarbon (CFC) cause thinning of the ozone layer, increase the risk of skin cancer, genetic mutation and eye damage.

## Steps to control air pollution

### 1. Legislation

- The Environmental Quality Act 1974
- Motor Vehicles Regulations
- Environment Quality Law
- Environment Quality Law
- Local Government Law Act

### 2. Education

- Educate the public on loving the environment
- Taking part in conserving and preserving the air quality

### 3. Science and technology

- Modern technology to reduce air pollution
  - i. Unleaded petrol and catalytic converter
  - ii. Factory chimneys filter fine particles and toxic gases
  - iii. Using incinerator

## Importance of keeping air clean

- air is the basic needs of life
- avoid respiratory diseases