Air and Atmosphere

Grade 6

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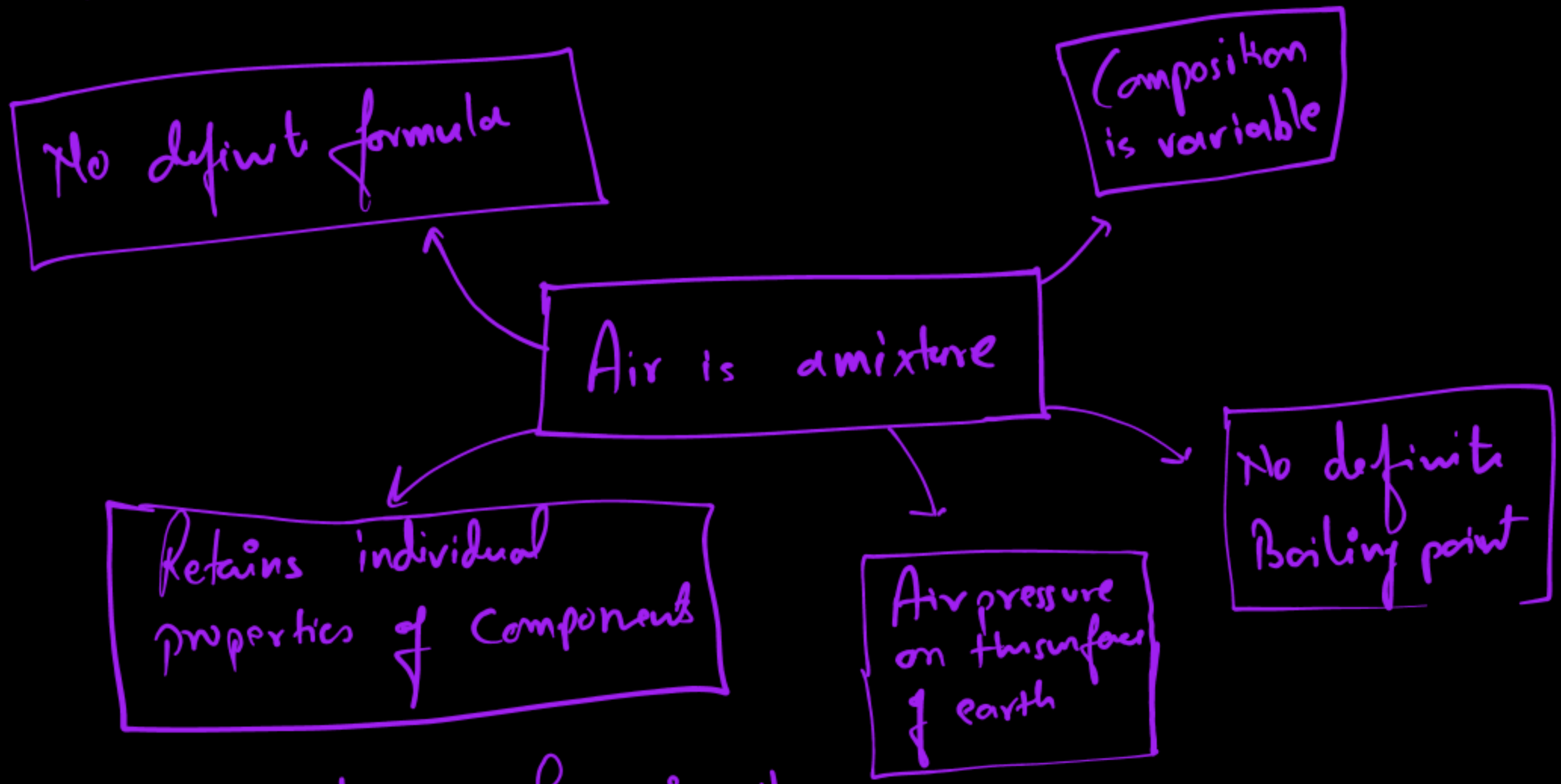
Air - Importance and Characteristics



⇒ Air is not present everywhere in the universe.

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Atmosphere

" Thick layer / blanket of air surrounding the earth. is k/a atmosphere.

⇒ Atmosphere extends only upto 320 km above the Surface of earth.

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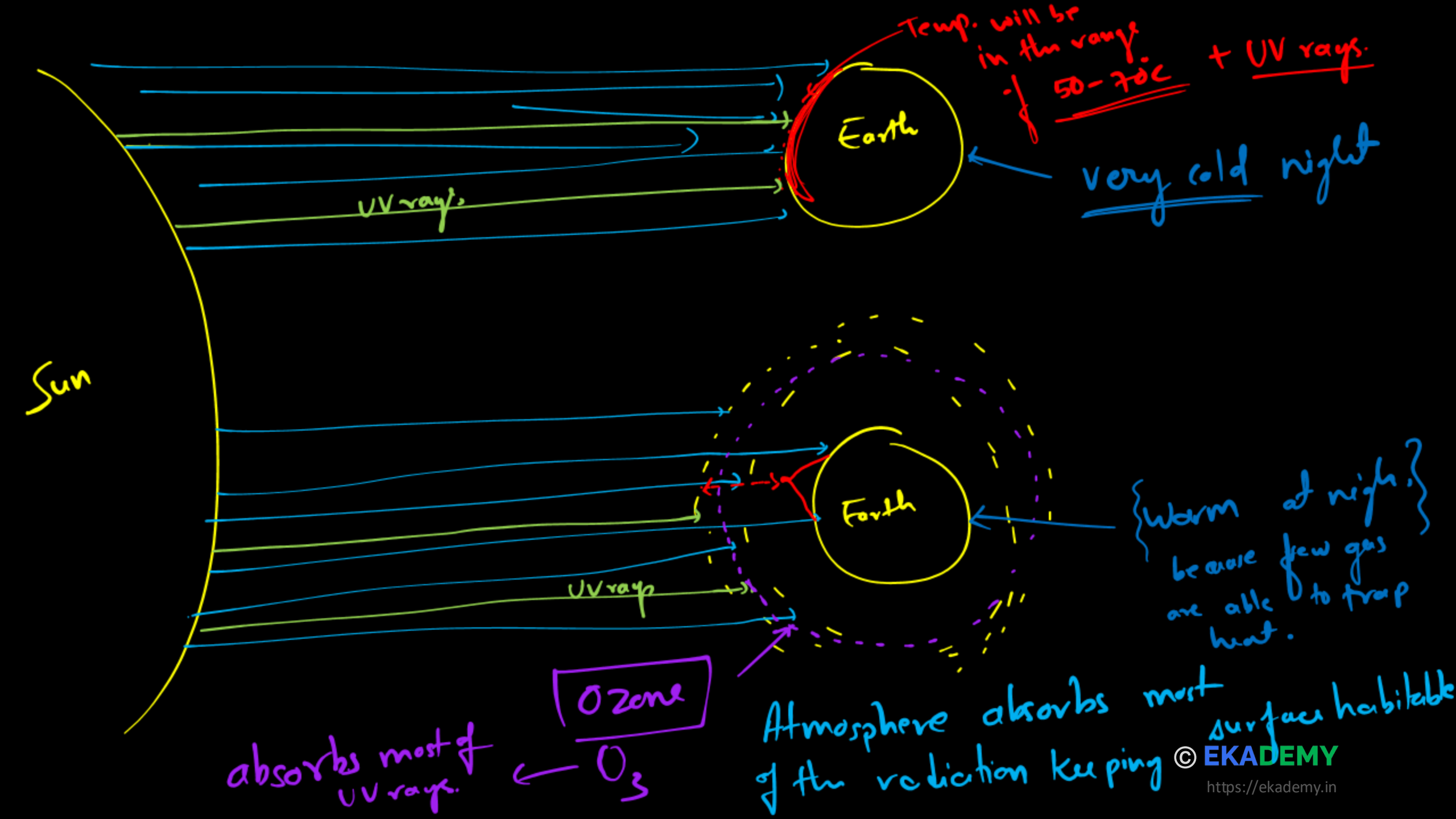

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Layers of Atmosphere

① Troposphere

→ Begins at the earth's surface and extends upto 20 km (high)

→ Density of air and temp. decreases with height.

→ Most of the weather phenomena occurs in this layer, due to rapid variation in temperature

⇒ It holds max. percentage of total mass of the atmosphere.

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(11) Stratosphere

→ ~~Stra~~ Starts from troposphere and extends upto ~50 km.] [20km

→ It holds around 19% of atmospheric gas.

→ Air is thin (less density).

→ Aeroplanes fly in this layer

→ Ozone layer is present in stratosphere.

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(iii) Mesosphere :

⇒ extends upto 85 above earth surface.

⇒ Air density is less than stratosphere.

⇒ Meteorites burns up in this layer.

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(IV) Thermosphere / Ionosphere.

→ aka upper atmosphere

→ it extends upto 690 - 950 km from earth's surface.

→ ~~loss~~ even lesser air density than mesosphere.

→ Air molecules in this layer absorbs most of the high energy radiation and gets ionised. Hence this layer consist of ions and free electrons.

⇒ This layer can reflect radiowaves. Hence, it helps in long-distance radiocommunication.

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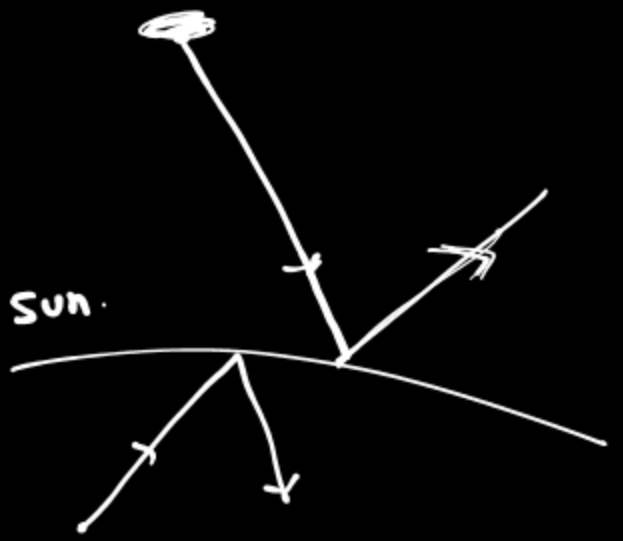
(v) Exosphere :

⇒ Outermost layer of the atmosphere

⇒ extends upto 10000 km.

⇒ absorbs ionising radiation from the sun.



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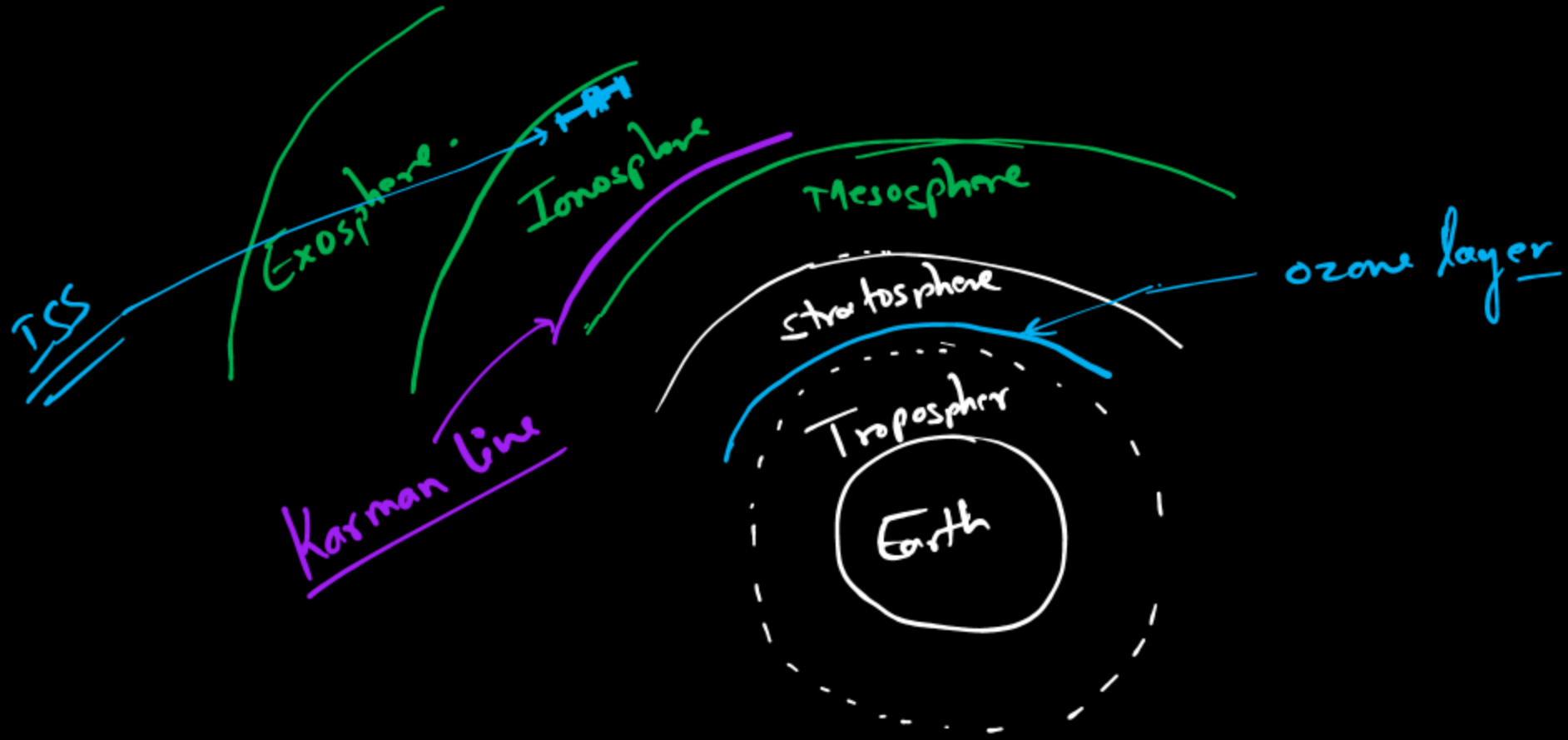

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Composition of Air :→

⇒ Air in a hollow box of 100 m^3 weighs 500 g.

$$\frac{.5\ kg}{100}$$

0.005 kg/m^3

density = $\frac{\text{mass}}{\text{volume}}$ | kg/m^3

∴ "mass per unit volume"

Wooden box of 100 m^3 weighs 20 kg.

density = $\frac{20}{100}$ = 0.2 kg/m^3.

⇒ Iron box of 50 m^3 weighs 20 kg.

density = $\frac{20}{50}$ = 0.4 kg/m^3. ✓

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Composition of Air

Air → mixture of many gases.

⇒ J. Priestley, A. Lavoisier, H. Cavendish

+

Study about different constituents of air.

Lavoisier coined names of oxygen and nitrogen

⇒ By volume, air

- Nitrogen 78%.
- Oxygen (21%)
- Argon (0.93%)
- Carbon di-oxide (0.04%)
- Other gases (Ne, H_2, methane, etc.) in very small amount.

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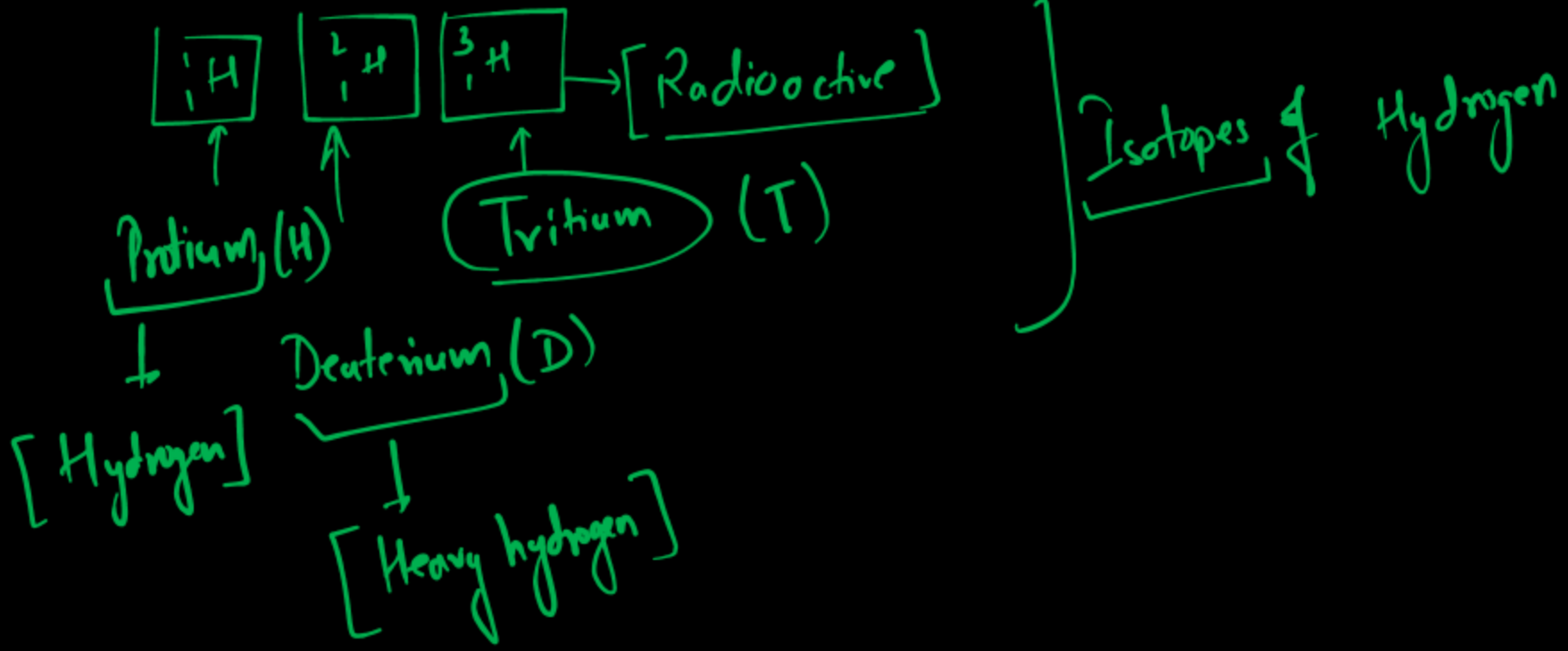

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Properties of the constituents

① Nitrogen (78% by volume)

→ Colourless, odourless, tasteless gas

→ Does not undergo burning

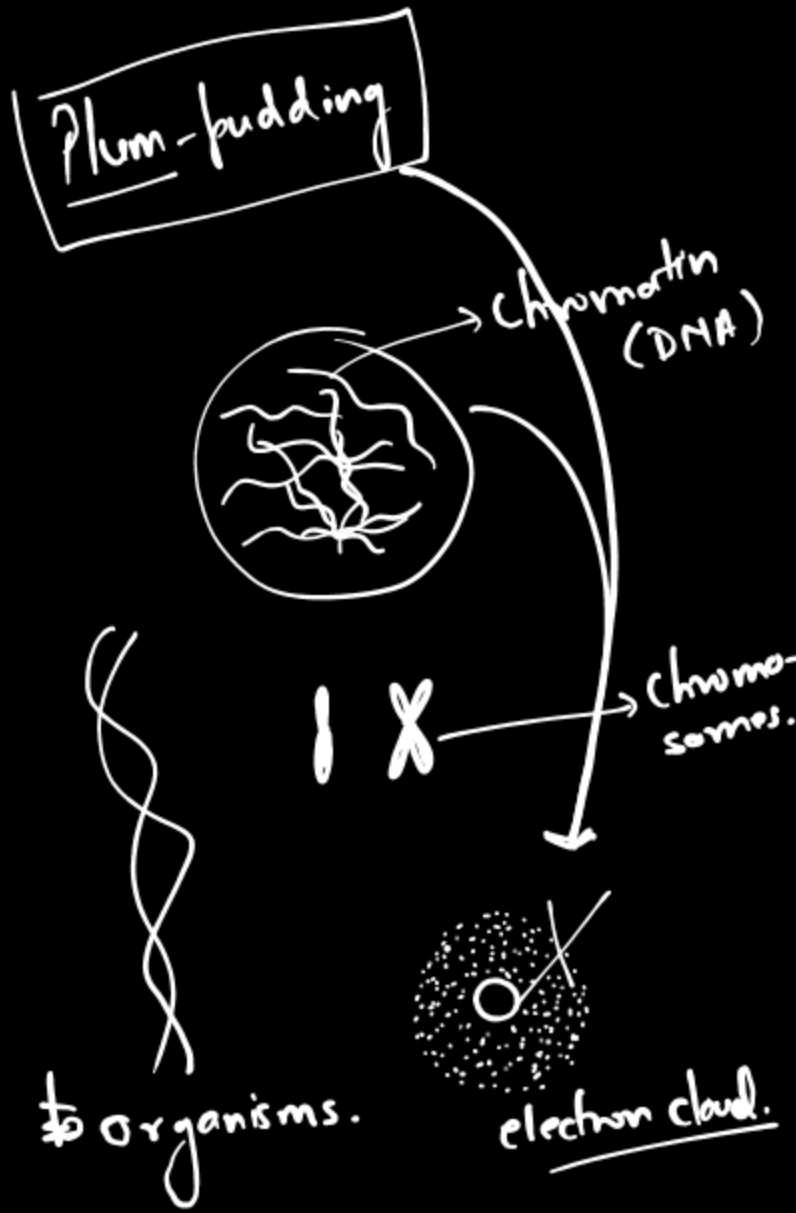
→ Non-supporter of burning / combustion.

→ Less reactive gas

→ Proteins are made up of nitrogen
  ↳ Essential for growth of living organisms.

→

→ Almost insoluble in water.



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② Oxygen

→ Colourless, odourless, tasteless. gas

→ Supporter of life.

↳ Respiration

→ Supported of combustion. (of fuel)

→ Causes rusting / corrosion of metals.

→ Added to atmospheric air by the process of photosynthesis.

→ Soluble in water. In small quantity.

↳ Respiration in aquatic life.

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③ Carbon dioxide

- → Colourless , Odourless
- → Product of burning and respiration
- → Moderately soluble in water.
- → Fire extinguisher.
- → Photosynthesis

CH_4 → methane

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(4) Water vapour

→ makes cloud / Rain

→ temperature regulation (humidity)

[Nitrogen is very important for plants :

→ overall growth of plants

→ major constituent of (chlorophyll) and protein

→ Soil is normally deficient in nitrogen.

∴ we add fertilizers → Natural → compost, manure
→ synthetic → Urea, NPK

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Importance of Air

1. Respiration
   - Aerobic → need: oxygen → eg Animals, plants
   - Anaerobic → don't need oxygen → Bacteria, yeast, some fungi

Aerobic Respiration:

Oxygen is taken inside body by the process of breathing

[Sugar + Oxygen → Carbondioxide + Water + energy]

$C_6H_{12}O_6 + O_2 \rightarrow (O_2 + H_2O + \text{energy}$

(glucose)

(to do work)

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* Plants exchanges gases through "stomata"

(2) Photosynthesis

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

$$CO_2 + H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + O_2 + H_2O$$

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③ Combustion (burning)

Combustion or burning is a process in which a substance takes up oxygen with the release of energy in the form of heat and light.

- byproducts of combustion/burning are carbondioxide and water vapour.

The material which undergoes combustion with the release of large amount of heat and light energy is known as fuel.

↳ eg: wood, coal, petrol, CNG, LPG, etc.

Heat is used for domestic and industrial purposes.

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Combustion

- (Wood)
- Carbon compound
- (Hydrogen & Carbon Compound)
- [Hydrocarbon]

+ Oxygen → CO_2 + H_2O + energy (heat + light)

five

[Infra red rays] → [carriers of heat]

[Glucose is a hydrocarbon]

frequency decreases →

(Cosmic Radiation) γ X UV [Visible] (IR) T.W. R.W.

VIBGYOR

" " "Similar to respiration"

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	(Combustion)	Respiration
①	Fast process	Slow process
②	Heat and light are released	Only heat is released
③	Very high temperature	Body temp.
④	Not a continuous process. (depends on amount of fuel) ⇒ [Hydrocarbon]	Natural & continuous process. (fuel: glucose)

H_2O → Hydrogen oxide

H_2O_2 → Hydrogen peroxide → more oxidising power

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H_2O_2 + [Soap] $\xrightarrow[[KI]]{\text{Yeast}}$ [O_2 gas] → Thick foam (Warm)

[Potassium iodide]

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⇒ **Rusting:**

→ Takes place in presence of air (O_2) and moisture

$x = 1, 2, 3, 4, \ldots$

Iron (Fe) + Oxygen (O_2) + Water (H_2O) ⟶ Oxide of Iron (Rust) $Fe_2O_3 . xH_2O$ Rust

or. Fe_2O_4

↓

Brown in colour and flaky in appearance.

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Role of CO_2 in atmosphere

Green houses gases [CO_2, methane (CH_4), SF_6, H_2O]

↳ Responsible for green house effect

↓

⇒ Phenomenon by which earth's atmosphere is able to trap solar radiation (heat) to maintain warm/moderate temp.

* CO_2 is major contributor in green house effect.

⇒ "Green house effect" a good effect.

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⇒ Excess CO_2 in atmosphere, may increase the temp. enormously.

kind of air pollution.

⇒ excess CO_2 is a pollutant.

- may cause acid rain.
- may contribute in global warming

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Global warming

It is a process that causes the Earth's temperature to rise gradually due to increased amount of CO_2 and other greenhouse gases.

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Air Pollution

The addition of harmful substances to air due to natural phenomena or human activities is called air pollution.

Causes of Air Pollution :→

① → Global warming
- → Excess use of fossil fuels.
- → Deforestation.
- → Thermal power plants.
- → Industrialization.

② Other common air pollutants are sulphur dioxide (SO_2), CO, NO_2, Ozone (O_3), Chlorofluorocarbons (CFC) etc.

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→ SO_2 and NO_2 gases are soluble in water.

$SO_2 + H_2O \rightarrow$ Sulphuric Acid (H_2SO_4)

$NO_2 + H_2O \rightarrow$ Nitric Acid (HNO_3)

} Very strong acid

$CO_2 + H_2O \rightarrow$ Carbonic Acid (H_2CO_3)

→ These gases may get dissolve in rain water and makes rain acidic.

↳ This results in Acid Rain.

[* Tajmahal at Agra is damaged due to Acid Rain]

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→ Sources of harmful gases are automobile exhausts, industries, and thermal power plants.

→ Carbon monoxide (CO) reduces the oxygen carrying capacity of the blood. results its into suffocation. (toxic gas)

⇒ Ozone is also a greenhouse gas and adds to the global warming. It is also a toxic gas.

⇒ Chlorofluoro carbons (CFCs) results in ozone layer depletion.

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Compressed Natural Gas

Use CNG instead of fossil fuels in vehicles

Growing trees and plants (Reduction in CO_2 level)

Afforestation.

Methods of prevention of air pollution

Usage of filters for chimneys in industries and power plants (Reduction of SO_2 & NO_2 levels)

Maximise Use of Solar Energy/ other renewable energy sources.

Increase the use of green hydrogen as energy alternative.

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End of the chapter

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