



Handwritten Notes
on
Environmental Issues

Environmental Issues

Pollution : It is an undesirable change physical, chemical or biological feature of air, H_2O or soil
Pollutant

Environment (Protection) Act : 1986

To protect and improve quality of environment.

Pollution

Origin	Physical nature	Part of environment	Emission
→ Natural	→ Noise	→ Soil	→ Point source
→ Anthropogenic	→ Thermal	→ Air	→ Non-point source
	→ Radioactive	→ H_2O	
	→ Gaseous		
	→ Dust		

Pollutants

Natural disposal

→ Biodegradable

- Domestic sewage

→ Non-Biodegradable

- DDT
- BHC (Benzene Hexa chloride)

Quantity & Quality

→ Quantitative

natural component of env.
e.g. CO₂, NO_x

→ Qualitative

Natural component X
made by humans
e.g. DDT

Form in which they persist

→ Primary

DDT, SO_x,
NO_x, H₂S

Secondary

NO_x + hydrocarbon

↓
O₃ + PAN

(Peroxyacetyl nitrate)

• Primary

• Less toxic

X

Oxidants / reducing

Secondary Pollutants

More toxic
(Synergism)

Photochemical reactions

Oxidising



Air pollutants

10^{12} tons \rightarrow Air pollutants

99.5%

Natural

0.05%

Anthropogenic

Sources

\rightarrow Fossil fuels

\rightarrow Industries

\rightarrow Vehicles \rightarrow Automobiles

80%

\rightarrow Aircrafts

\rightarrow Natural

75%
Noise pollution

- Fungal spores
- Pollens
- Volcanic gases
- marshes
- Paddy fields

- Soot
- Fly ash
- Gases

Air Pollutants

Automobiles

Tobacco Smoke

Ist

• CO

CO

• CO Ist

• SO_x

• HC

HC (Hydrocarbon)

• HC - III rd

• Particulate matter

NO_x

• NO_x - II nd

• Other gases

• Polonium - 210
Carcinogenic

decreasing order



1 Particulate Matter (solid, liquid)

> 10 μm

\leq 10 μm

Lung disease due to P.M.

Settleable particulate matter

Suspended particulate matter

SPM

- Pneumoconiosis
- Byssinosis \rightarrow Cotton
- Siderosis \rightarrow Iron
- Silicosis \rightarrow Silicon
- Asbestosis \rightarrow Asbestos

> 1 μm

< 1 μm

Aerosol

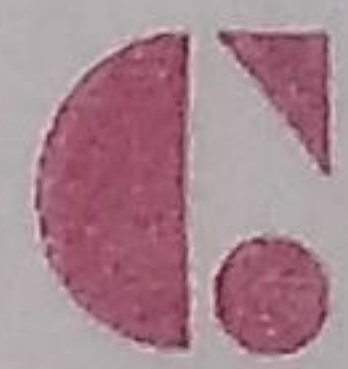
Solid
• Dust

Liquid
• Mist

CPCB \rightarrow Central Pollution Control Board

\leq 2.5 μm
P.M. 2.5 μm

• Irritation
• Inflammation
• Lungs



2

 SO_x NO_x

1

Photosynthetic activity ↓

✓

remove Mg from chlorophyll

E.T.S

 Mg^{+2}

Chl

Phaeophytin

e.g. Pea, lichen.

2

Acid Rain $< 5 \text{ pH}$

✓

$SO_x + H_2O \rightarrow$ sulphuric acid

$NO_x + H_2O \rightarrow$ Nitric acid

Corrosion of marble
Stone leprosy.

$CaCO_3 \rightarrow CaSO_4$
↓
peeled

Damage

 SO_x NO_x

HCl.

65%

30%

5%

3

Smog ✓

- fog - Smoke
dust
gases
 H_2O vapour

Classical smog

Photochemical smog

1952

1946

London smog

Los Angeles smog



1° pollutants
SO_x, H₂S

2° pollutant
O₃ + PAN

Low temperature

warm temp

• Reducing

• Oxidising

3 Hydrocarbons and Volatile organic compounds

89% Natural

10% Anthropogenic

- Grass
- Marshy land
- Paddy fields
- decomposition of organic matter

- Agricultural Burning
- Fossil fuels

CH₄ → Maximum pollution amongst hydrocarbons

Ethylene

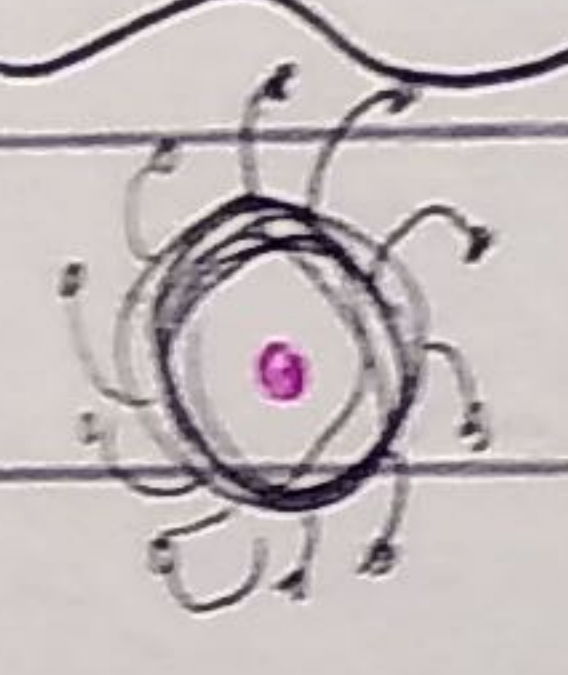
→ Effects →

- Premature fruit / flower drop.
- Effects - nose, eyes, lungs, throat.
- CH₄ → green house gas.

Formaldehyde → Indoor pollution.
- released from newly formed carpets.

CO → 200 more affinity for Hb as compared for to O₂.

CO-Hb → Carboxyhaemoglobin
↓
O₂ ↓

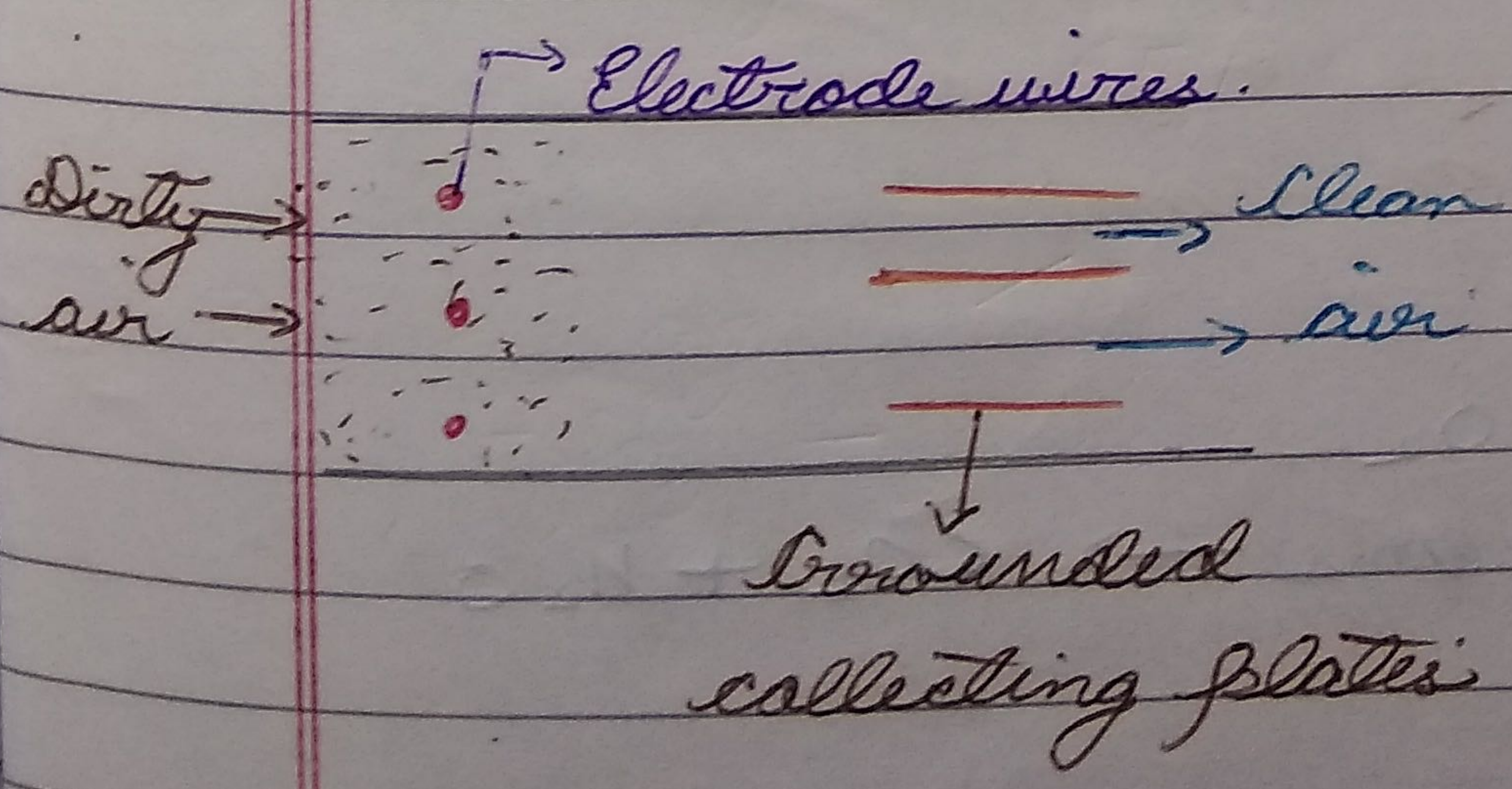


Tobacco smoke →
increases chances of lung diseases by - 6 times
lung cancer → 10 times
Heart disease → 2 times

Control of Air Pollution

99%
P.M
ESP

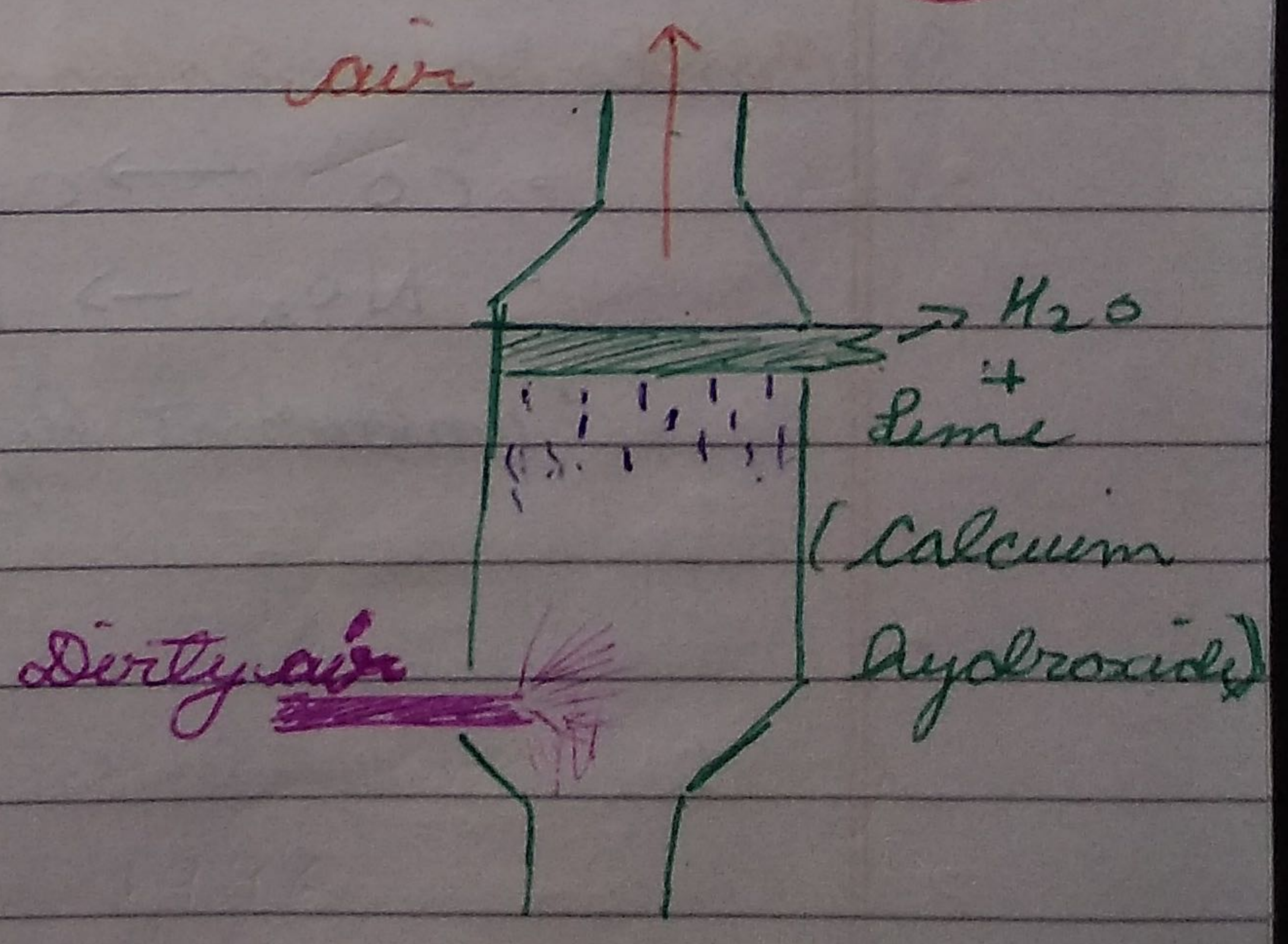
Electrostatic Precipitator



scrubber

Grasses
SO_x

Clean air



Control of Vehicular Air Pollution → Delhi

- 1990 → 41 most polluted cities
Delhi ranked 4th.

• PIL filed

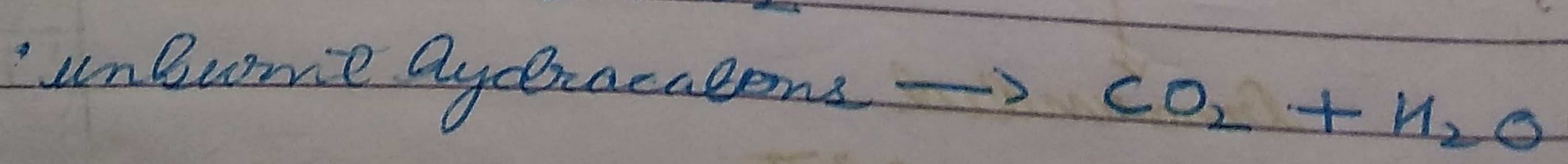
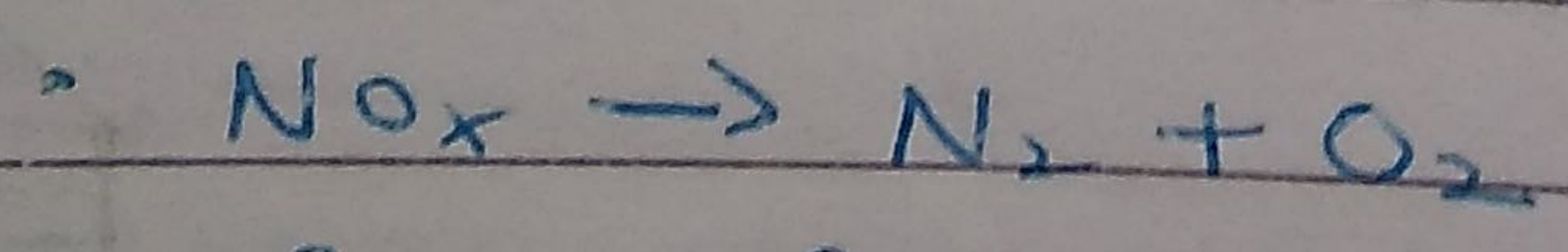
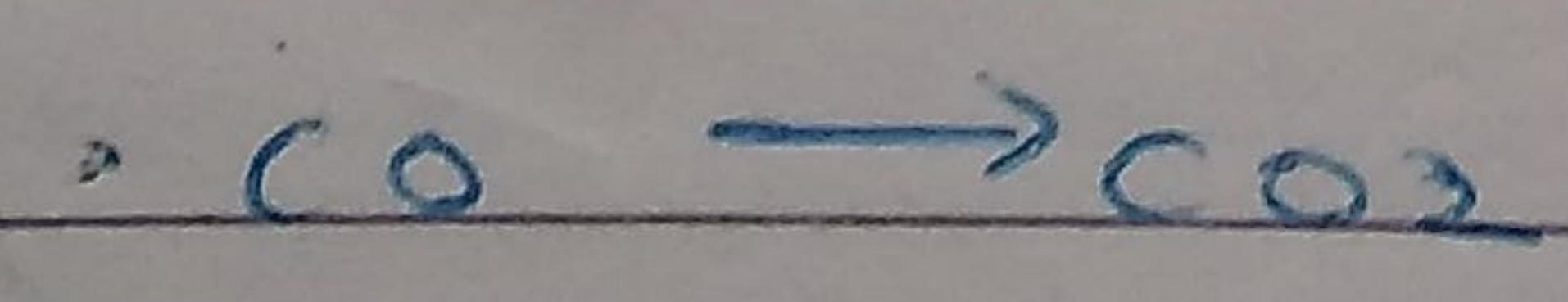
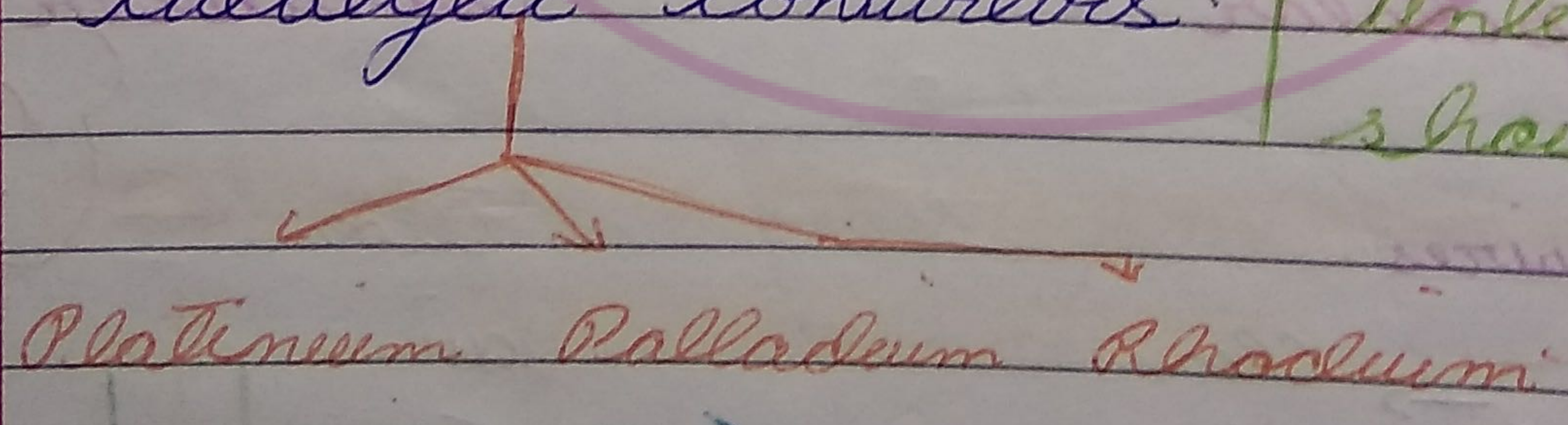
(a) Buses → Diesel → CNG

- Benefits:
 - cheaper
 - Burns efficiently
 - Siphoned x
 - Adulterated x
- Demerits:
 - Laying of pipelines.

• Measures taken

- Low Sulphur → Diesel and petrol

- Catalytic converters. *Unleaded fuel should be used*



Euro norms II

S - Diesel → 350 ppm.
Sulphur (S) - Petrol → 150 ppm.

Goal set by govt. of Delhi →
S - Diesel / petrol → 50 ppm

11 cities →

- Delhi
 - Mumbai
 - Kolkata
 - Chennai
 - Bangalore
 - Hyderabad
 - Ahmedabad
 - Pune
 - Surat
 - Kanpur
 - Agra
- Euro III
April, 2005
- Euro IV
April, 2010

Rest of the cities → Euro III, April 2010

Air Act - 1981 - Passed.
" " - 1987 - Amended.

To include noise as air pollutant.

Noise → undesirable high level of sound.
Unit → decibel dB.

- moderate conversation → 60 dB
- Loud " → 70 dB
- scooter → 80 dB
- Truck → 90 dB
- Jet aeroplane → 150 dB
- Rocket → 180 dB.

Harmful Effects:

Physiological, Psychological disorders

Hearing Ability:

- 150 dB or >
 - Ear Drum Damage
 - Permanent impairment of hearing ability
- chronic exposure to low noise level.

(ii) Sleeplessness

(iii) High B.P ↑

(iv) Increased heart rate

(v) Alternation in Breathing patterns.

(vi) Allergic reactions
affects

(vii) Eyesight.

Control

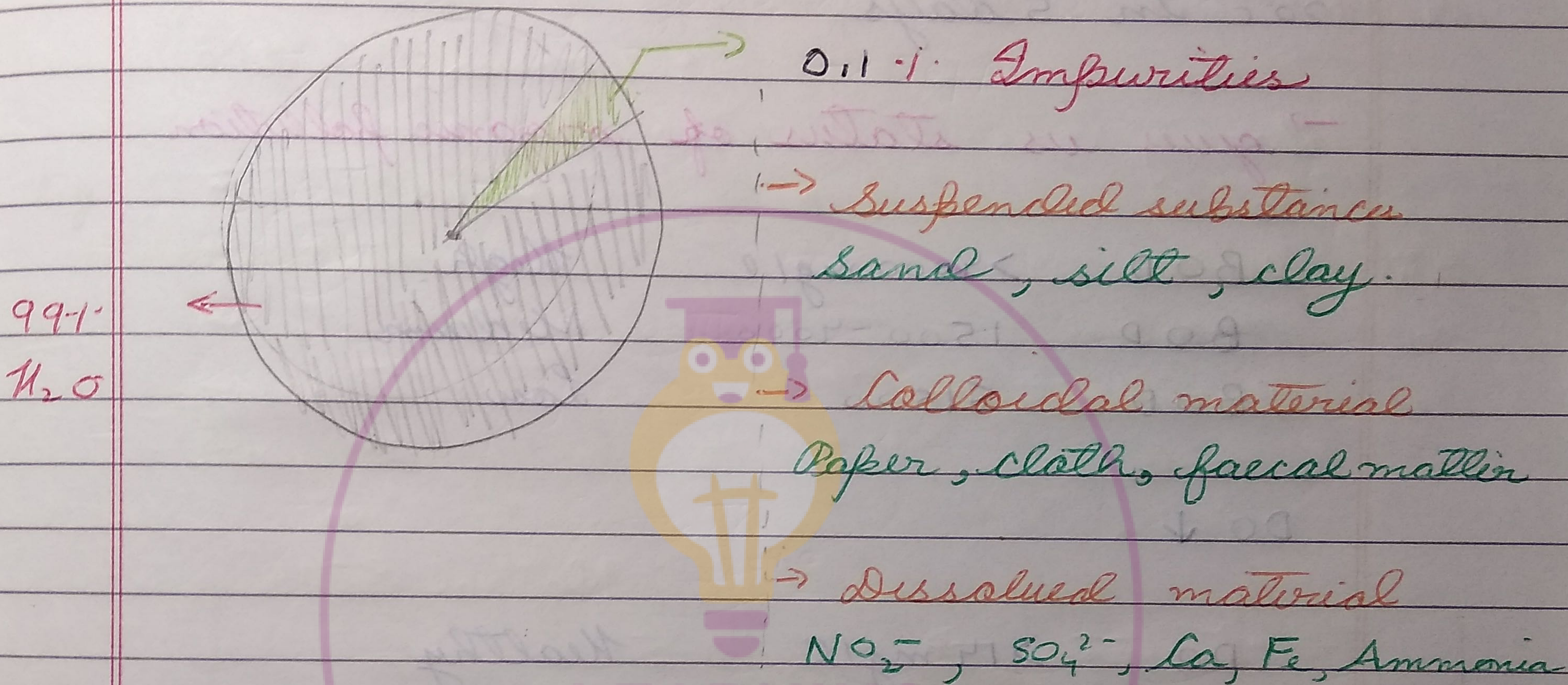
	Acoustic Zoning	Day	Night	
1	Industrial	75 dB	70 dB	Green
2	Occupational	65 dB	55 dB	muffler
3	Residential	55 dB	45 dB	Ashoka
4	Silent	50 dB	40 dB	neem



Water Pollution

→ sources:

- (i) Municipal waste water
- (ii) Domestic sewage



Putrescibility →

Domestic sewage consists of biodegradable organic wastes.

- (i) It is the property of biodegradable organic wastes to get decomposed by the decomposers.

Sewage fungus:	→ Bacteria	- E. coli, Beggiata
	→ BGA	• Oscillatoria, Microcystis
	→ Fungus	• Mucor, Fusarium
	→ Green algae	• Chlamydomonas, Scenedesmus

Decomposers → require oxygen

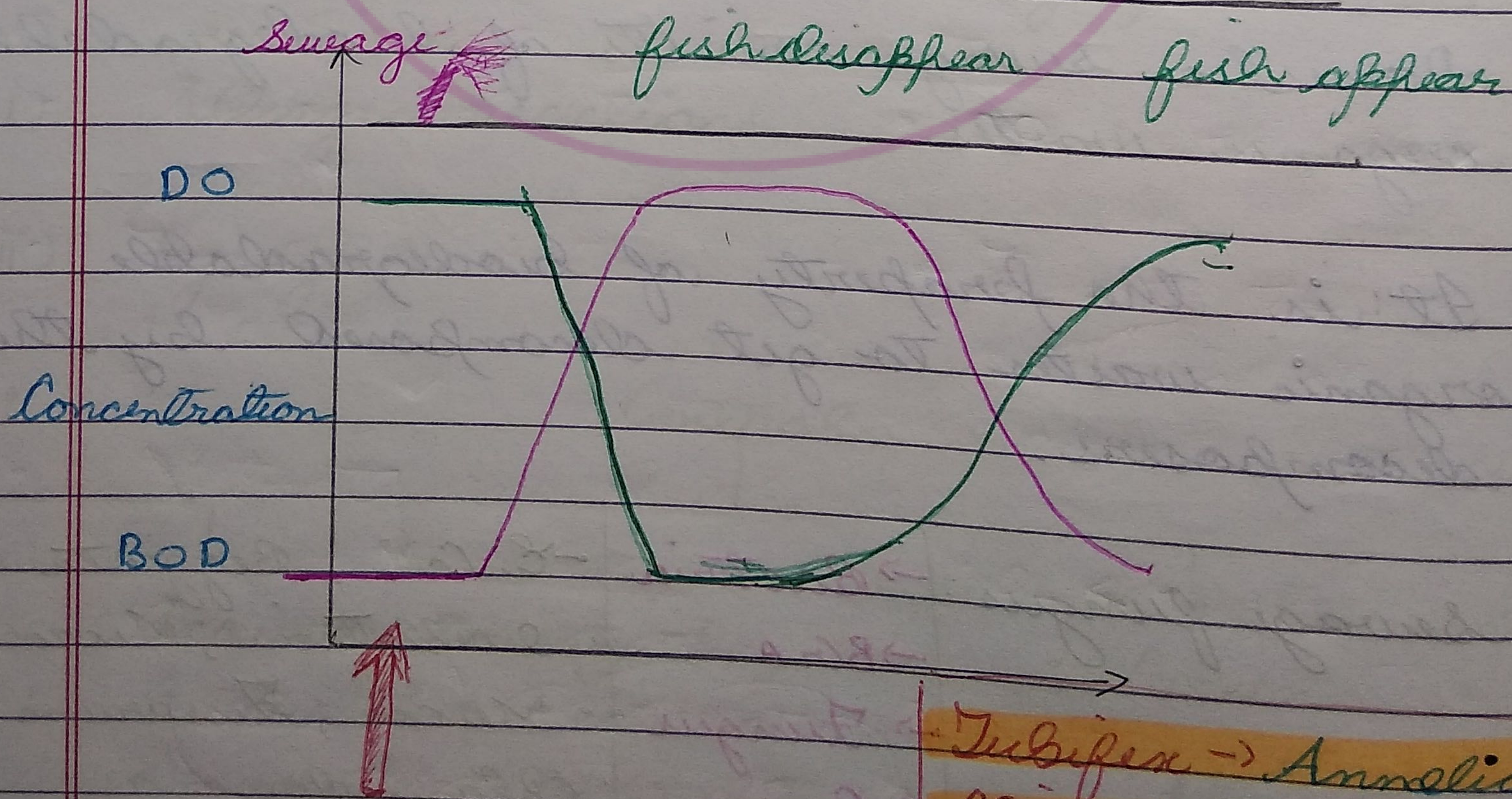
BOD ↑ → Amount of oxygen required in milligram for decomposition of organic matter in 1L of water at 20°C in 5 days

→ gives us status of organic pollution

BOD	> 4000 mg/l	High
BOD	1500 - 4000	Medium
BOD	< 1500	Low

DO ↓

DO	> 14 mg/l	Healthy
DO	4 < x < 8 mg/l	Polluted
DO	< 4 mg/l	Heavily polluted



- Tubifex → Annelids
- Chironomus → Insect
- E. coli → Faecal matter

Effects of H₂O pollution:

(a) Biomagnification / Bioconcentration

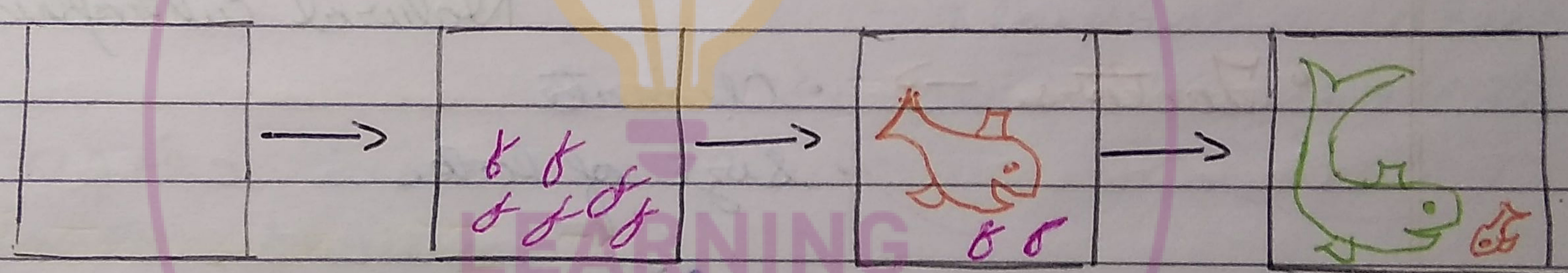
It is the increase in concentration of persistent pollutant or toxic chemical per unit wt of organism with rise in trophic level.

e.g


Island - U.S.A

DDT

Fish-eating bird → i.e. Bald Eagle



• water	• Zooplankton	Small fish	Large fish
Body		fish	
0.003ppb	0.04 ppm	0.5 ppm	2 ppm

→ 
Bird 25 ppm

- affects Ca-metabolism
- Thinning of eggshells
- Premature egg breakage
- led to population decrease

- In humans →
- Liver cirrhosis
- Softening of brain
- Hypertension
- Defective sex hormone

- Biomagnification is caused by →
- DDT, BHC, Aldrin, Mercury
- (B.H.C → Benzene hexachloride)

Q

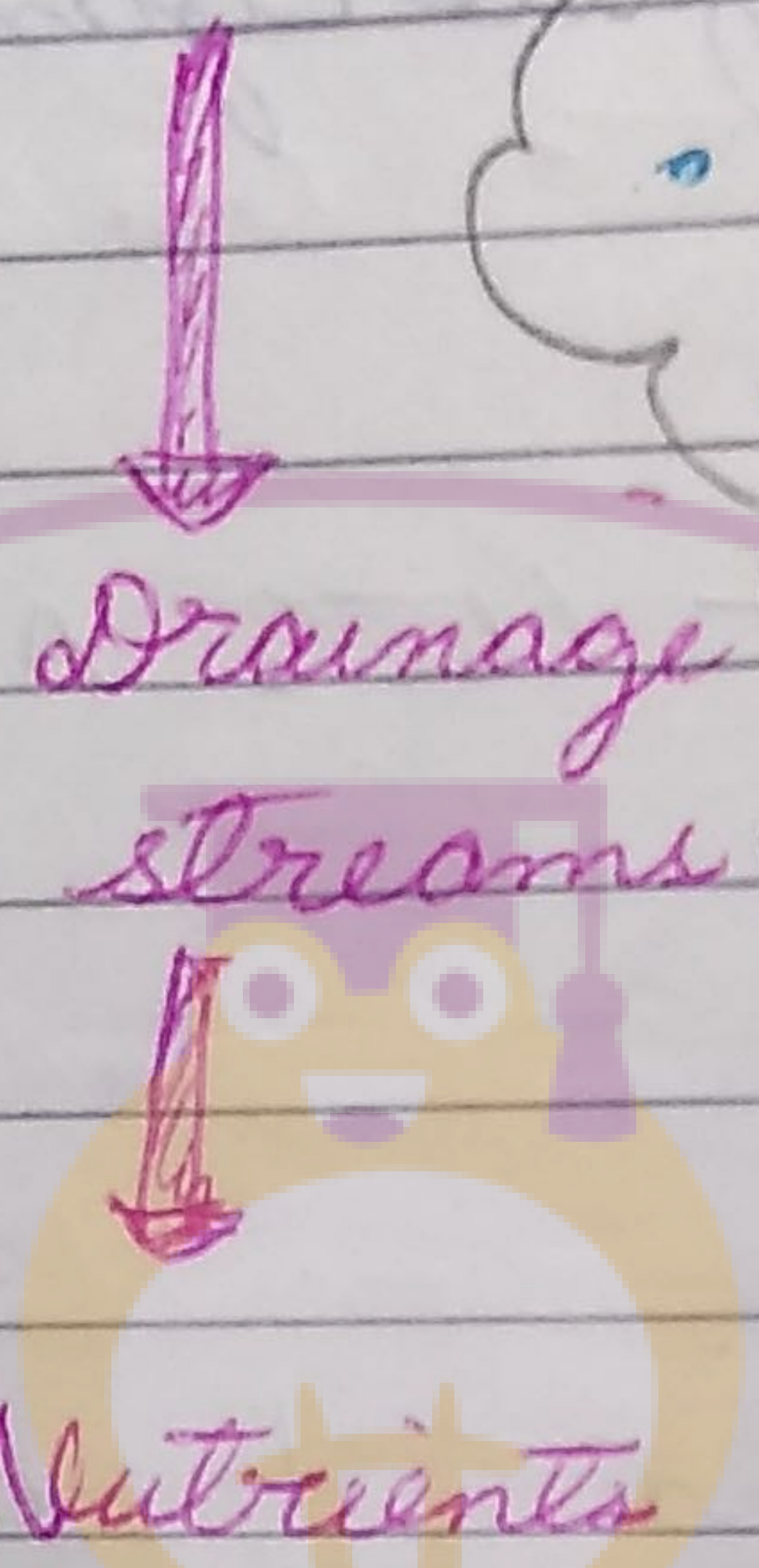
Eutrophication

Natural

Cultural / accelerated

(i) Natural :

- (i) Young lake
- (ii) Cold
- (iii) Deeper
- (iv) Clear
- (v) Biodiversity ↓



- Warmer
 - Shallower
 - Turbid
 - Biodiversity ↑
- H₂O ↓
Land ↓
Thousand of years

Natural Eutrophication

- Factors →
 - Climate
 - Size of lake

(ii) Cultural Eutrophication :

- Human activities ↓
- DO in the lake ↓
- Two prime contaminants added ↓
- Nitrate and Phosphate ↓
- Threat to survival of aquatic life
- O₂ < 4mg/l ↓
- Overgrowth algae
- BGA (Blue Green Algae)
- Death of aquatic organism choke the lake to death.
- Hot water
- Dissolved O₂ content ↓
- Salmon-spawning ×
- Trout → egg ×

myCOMPANION



• Case Study: Integrated Waste W₂ Treatment.

• Arcata - Northern coast of California.

+

Humboldt State University

Two steps.

• Sanctuary

- Conventional
 - Sedimentation
 - Filtration
 - Chlorination

- Biological
 - 6 marshes, connected -
 - Plants, algae, bacteria, fungi
 - Neutralise, absorb, assimilate pollutants

FOAM: Friends of Arcata Marsh.

• Disposal of Human excreta →

↓
"Eco san toilets"

↓
Dry composting toilets

↓
Cost effective

↓
Efficient / Hygienic

↓
later used as Manure / Fertilisers

Used in Kerala and Sri Lanka.



Solid Wastes:

• Everything that goes out in trash:

1 Municipal solid waste →
School, homes, stores, offices;
Food waste paper, glass, textiles

2 Industrial waste

3 Agricultural waste

4 Mining waste

5 E waste → Electronic waste:

Irreparable computers and other
electronic goods.

Developed Countries 50% E waste → Developing countries
India, China, Pakistan.

Disposal → Solid Wastes

i	Sanitary Landfills	Salvage	Incineration	Pyrolysis
	↓	↓	- O ₂ ✓	O ₂ ✗
	Trench	Sorting waste	- 900°-1000°C	1650°C
	↓	↓	- 1300°C	
	Dumped waste	Recycled waste		
	↓	↓		
	Landfilled	Separated		

Biodegradable waste



• Case Study → Remedy: Plastic Wastes.

• Ahmed Khan

• Bangalore.

- Polyblend a fine powder of modified recycled plastic.

+

Bitumen

Provided:

RV College of Engineering and Bangalore City Corporation.

• Inc. H₂O repellent capacity of Bitumen

• Increases Road life by a factor of 3

Rag Pickers 2002 → 40 km.

Rs 0.40/kg Rs 6/kg.

• Agrochemicals and their effects

(a) Biomagnification.

(b) Accelerated eutrophication.

(c) Soil Pollution

↓

↓

+

-

• Soil productivity ↓

• Soil productivity ↓

• Addition of fertilisers, pesticides

• Loss of top fertile layer.

• Erosion.

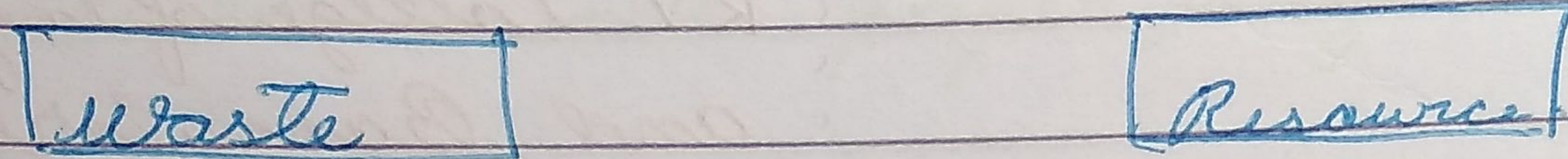


Case Study: Integrated organic farming

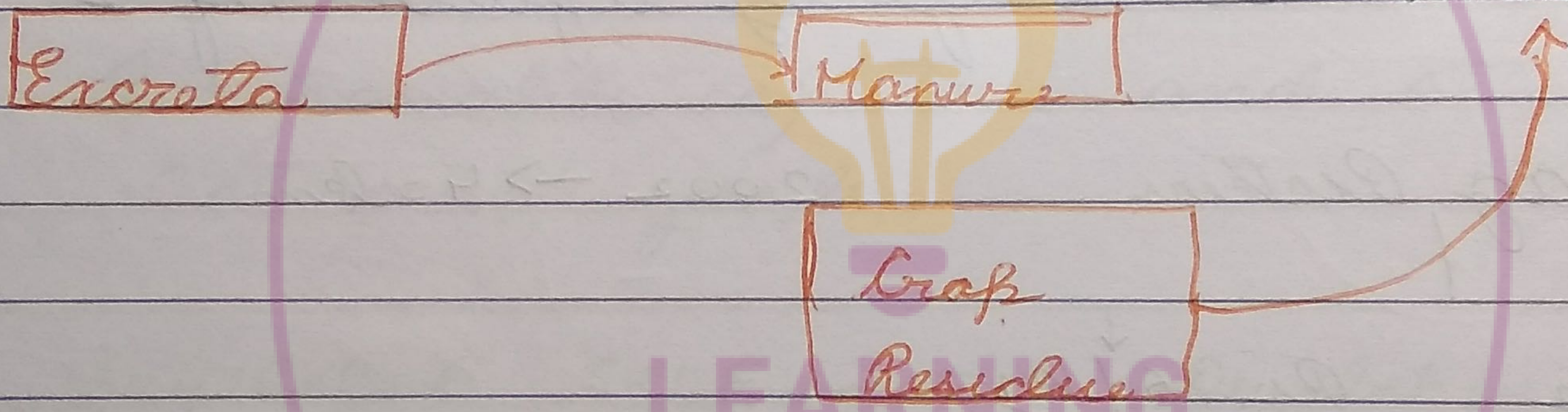
- Cyclic
- Zero waste procedure.

→ Ramesh Chandra
Dagar
→ Sonapat

1 process → 2nd process → KKWC
→ 5000 farmers

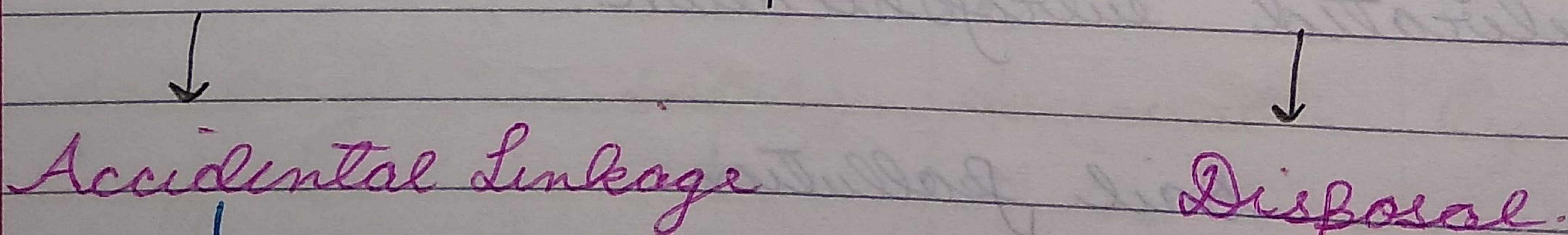


- Cattle farming → Crop → Natural gas
- Fertilisers



Radioactive Pollution:

Nuclear energy



- ↓ Accidental Leakage
- ↓ Three Mile Island
- ↓ Chernobyl Incident

- ↓ Disposal
- containers
- ↓ 500 m deep

Radiation

← High
- Lethal

→ Low
- Lethal