

Open Elective

Green house effect \rightarrow Green House gases

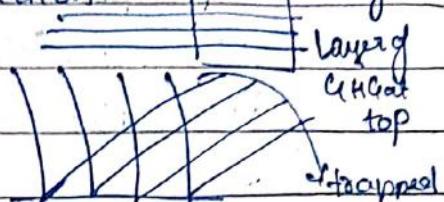
\rightarrow CO_2 (60%)

\rightarrow CH_4 (methane) (20%)

Ozone layer \rightarrow UV rays protection.

Breaks the ozone layer.

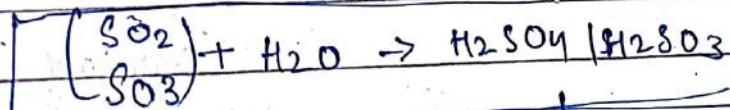
(20%) ozone layer.



Primary pollutants and Secondary pollutants

naturally occurring

+ reaction with other pollutants



primary pollutant

secondary pollutant

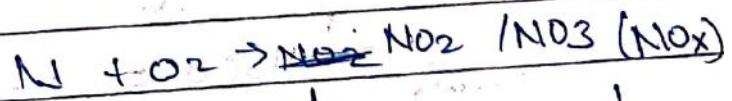
primary

C

H

O

N



primary

secondary

dynamic relationship with N and O, it can be

NO_2 or NO_3

so we use NOx

Sources

Natural

Anthropogenic
(Man-made)

- NO_2 more here

- Industries

- SO_2 more here

Two different types of fuel

NOx is harmful but it takes time to effect

Gaseous pollutants

(i) CO (Carbon monoxide)

(ii) Sulphur

alpha

$$\therefore \text{HbCO} = 0.005 C^{0.65} (\alpha)^{0.63}$$

carboxy

hemoglobin

C = concⁿ of CO (ppm)

t = time of exposure (min)

α = physical Activity level

1 (sedentary)

3 (normal)

3 (heavy work)

Ques / Make ^{analog} estimate of the saturation value of HbCO in the blood if CO breathe is 100 ppm

Use the following eqn

$$\text{Saturation} \quad \frac{\text{HbCO}}{\text{HbO}_2} = m \cdot \frac{P_{\text{CO}}}{P_{\text{O}_2}}$$

Soln

$$m = \text{const.} \quad P_{\text{CO}} = 100 \text{ ppm} \quad P_{\text{O}_2} = 21 \times 10^4 \text{ ppm}$$

(200 - 250)

O₂ = 21% in normal air
for human blood

$$1\% = 10^4 \text{ ppm}$$

$$21\% = 21 \times 10^4 \text{ ppm}$$

$$\text{Saturation} = \frac{\text{HbCO}}{\text{HbO}_2} = \frac{200 \times 100}{21 \times 10^4} = 0.095$$

2017C: 10/10/18 Prakash Kumar

Prakash
Kumar
10/10/18

Ques: Determine the value of HED in the Board
for a normal working ability of the
person. It is expressed in a coefficient
for 1 hr. The value of C is 100.

Soln:

$$d = 2$$

$$\frac{d}{2} = 60 \text{ min}$$

$$C = 100$$

$$HED = 0.05 C^{\frac{1}{0.5}} \left(\frac{d}{2} \right)^{0.5}$$

$$HED = 0.05 (100)^{0.5} (60)^{0.5} \times 10$$

$$HED = 0.05 \times 10 \times 60$$

EIA → Environmental Impact Assessment

ELA → Environmental Audit

Scandinavia → North of Europe, Denmark

Sweden → Sweden

• 1993 → Environmental Impact Assessment

• 1998 → Rio Earth Summit (UNFCCC)

Climate → The big wind, long-distance

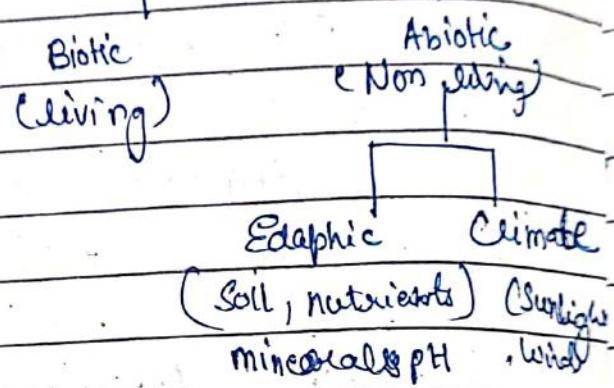
over 9 ways of mitigation

Tropical → Tropical rainforest & super-rich
like Elton & types of
countries & vegetation

flame → The ways of plants together
etc.

Lowest pt of South Pacific Ocean → Marian Trench
 Biosphere → The thin part blue Earth's
 lowest pt to ~20 Km above it
 where life exists is called Biosph.

→ components → Ecosystem
 of Biosphere



⇒ The continuous science of study of living system with Non living system is called ecology.

Imbalance b/w living and Non living components is called pollution.

$\beta P + \gamma F$
 (PVA) (PPFA)

Population Growth

L1 SA \rightarrow New World

$$[PG] = [C(BR+IR) - (DR+ER)]$$

↓
Birth Rate

↓
Emigration Rate

| Region | BR | DR | ER |
|-----------------|-----|-----|-----|
| World | 2.2 | 1.9 | 7.8 |
| Developed world | 1.1 | 1.0 | 1.1 |
| Developing | 2.5 | 1.9 | 1.6 |
| Africa | 3.8 | 1.4 | 2.4 |
| N. America | 1.4 | 1.9 | 5.1 |
| Europe | 1.0 | 1.1 | 1.1 |
| Asia | 2.2 | 1.8 | 1.4 |
| S. America | 2.4 | 1.8 | 1.8 |
| Oceania | 1.8 | 1.7 | 1.1 |
| Russia | | | |

Shifts in

Se \rightarrow Social Segregated Shompson

St Physical \rightarrow Segregated. Tottel m

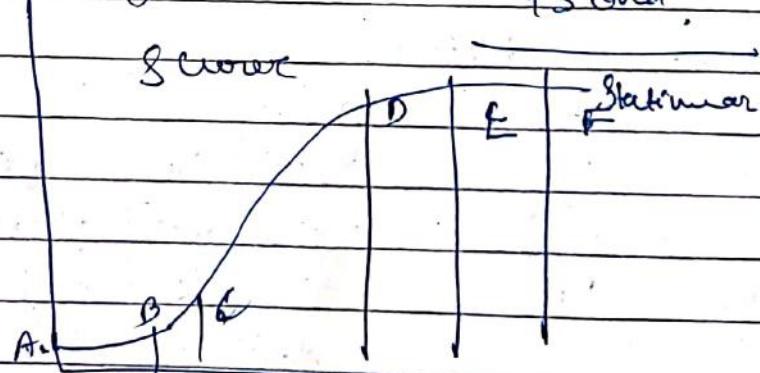
Andaman Nicobar

Island

Population Growth

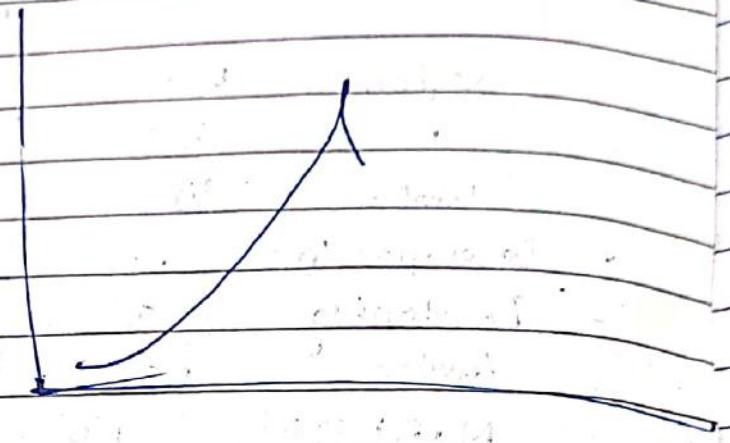
Growth

Stationary



16.9.11 \rightarrow India

Population density in India

395 persons / per km² in 1999415 persons / Km² in 2025

Reasons of population growth

- (a) Early puberty
- (b) Early marriage
- (c) Social pressure for desirability of male child
- (d) Fertilization in adoption of family

Planning measures

- (e) Polygyny (multiple wives)
 - (f) Improved health care
 - (g) Diff b/w BR and DR
- Tubectomy (female)
vasectomy (The male surgical operation)
IUD
(Medical termination of pregnancy)
Abortion

Scurve phases

AB - lag phase

BC - positive acceleration
acceleration phase

CD - exponential phase

DE - -ve acc. phase

EF - stationary phase

$$AB \frac{dp}{dt} \propto p$$

$$BC \frac{dp}{dt} \propto \text{const.} p$$

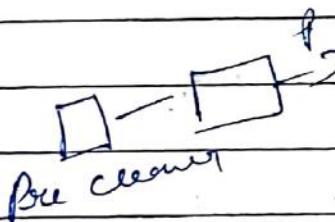
$$CD \cdot \frac{dp}{dt} = \text{const.}$$

$$DE \frac{dp}{dt} \propto (P_s - p) \quad (\text{saturation population})$$

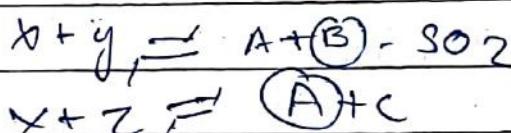
21/09/22

Q E

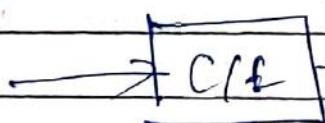
Air pollution - Control method & equipment



PM 10
PM = 2.5 \rightarrow Bag filter
ESP



\rightarrow



10

$$\text{Efficiency} = \frac{I - O}{I} \times 100\%$$

Gravitational settling chamber \Rightarrow

used to remove

particly

with size

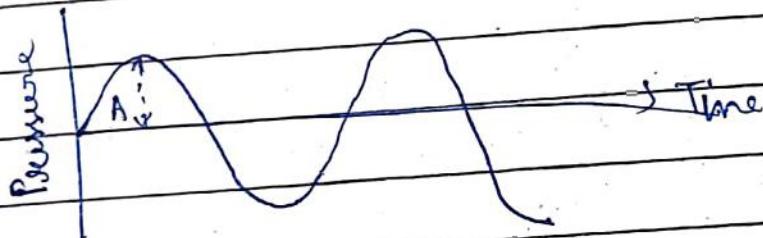
greater than x mm

function of inclination at bottom in cyclone separator.

22/09/22

Noise Pollution

- Sound - Sound is physical phenomenon that stimulates the sense of hearing
- Sound is a Manifestation of vibration & travels in wave patterns through solids liquids and gases.
- Sound waves of equal amplitude with increasing frequency from top to bottom



Basic Terminology -

- Frequency - is the no of cycles completed in unit time relation.
- Its unit is cycles/sec or Hz

Intensity - Amount of sound energy generated in one cycle is called intensity.

Difference b/w Sound and Noise

| | <u>Sound</u> | <u>Noise</u> |
|----|------------------------------------|---|
| 1. | Pleasant to hear | Unpleasant to hear. |
| 2. | Constant to pitch | Constantly varying pitch |
| 3. | Regular periodic motion. | Not so regular and periodic |
| 4. | Produces meaningful communication. | doesn't Produce meaningful communication. |
| 5 | Unit = Hz | Unit - decibels (dB) |

Level of noise

$$L = \log_{10} \left(\frac{S}{S_0} \right) \rightarrow \text{bel}$$

$$L = 10 \log_{10} \left(\frac{S}{S_0} \right) \rightarrow \text{decibels}$$

Noise Pollution - Any unwanted sound that pollutes the environment.
 - Any noise irritating us comes in noise pollution

Sources of noise

- Machinery → Industries → Radio, TV
- Vehicles → Loud speakers → AC, Appliances
- Construction → Air planes → Indoor sources.

Noise Control Measures

Indian Standard code - Norm. dB

- Industrial
- Day time = 75 decibels
 - Night time = 70 dB

Commercial

Day - 65 dB

Night - 55 dB

Residential

Day time - 55 dB

Night time - 45 dB

Effects of Noise Pollution -

- Annoyance
- loss of hearing
- health effects
- Interference in communication
- working efficiency reduces

23/09/22

Cyclone \rightarrow formula \rightarrow operating problems

(Imp) ESP (Electrostatic Precipitator)

operating principle \rightarrow depends on charge of particles

(Adv & Disadv) \rightarrow higher efficiency
 \rightarrow diagram

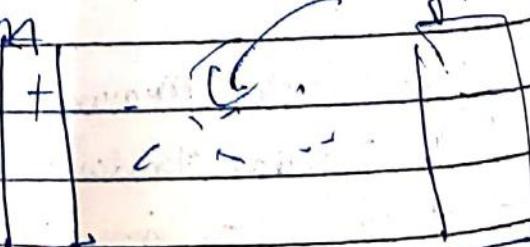
\rightarrow efficiency (formula)

\rightarrow Design Parameter

\rightarrow Adv / Disadv

all migration
of particle

\rightarrow Applications



Date: _____
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fabric filter → clothes used for filtration
→ widely used / cheaper
→ filter bag
→ operating problems.
→ After Materials used for
bag filters.

Climate Change → IPCC
Inter Govt. Panel on
Climate Change
— Chairman - RK Pachauri
Reasons → Anthropogenic
Monsoon
Phenomenon — El Nino
La Nino

Initiatives to Control Climate Change

→ UNEP Conf 1972 Stockholm (Sweden)
→ Rio Earth Summit - 1992 (Brazil)
(Rio De Janeiro)
— UNFCC — 1995

(United Nations Framework on
Climate Change) → 1993 - 95 - 97

COP 1 → Berlin (1995)

COP 2 — Geneva (Switzerland)

COP 3 — Kyoto (Japan)

COP 4 → ..

COP -
COP8 → Delhi
Milan

COP25 → Scotland (Glasgow)

Important COP

COP3 → Kyoto → When all nations meeting decided that, in the year 2010 the total GHG emissions should be 50% of 1990

Emission trading → traded emission of
It is a ~~wanted to emit~~ C₆H₆ gases
in proportion to poor countries population
with money.

→ administrative approach to cap
and trade

NAPCC → National action plan

on Climate Change

SDG

→ Sustainable

Fredit Goal
Dev.

Vision

emissions

1 2 objectives

NAPCC

- 8 goals / mission
- Mission for Solar
- Mission for enhanced energy eff.
- mission on sustainable classified
- " " agriculture
- Water mission mission
- Mission for green state
- mission Strategic Knowledge mission
- mission for sustaining the humanity
- on ecosystem.

Midsem Syllabus

Unit 1 and Unit 3

Biosphere

FO NC

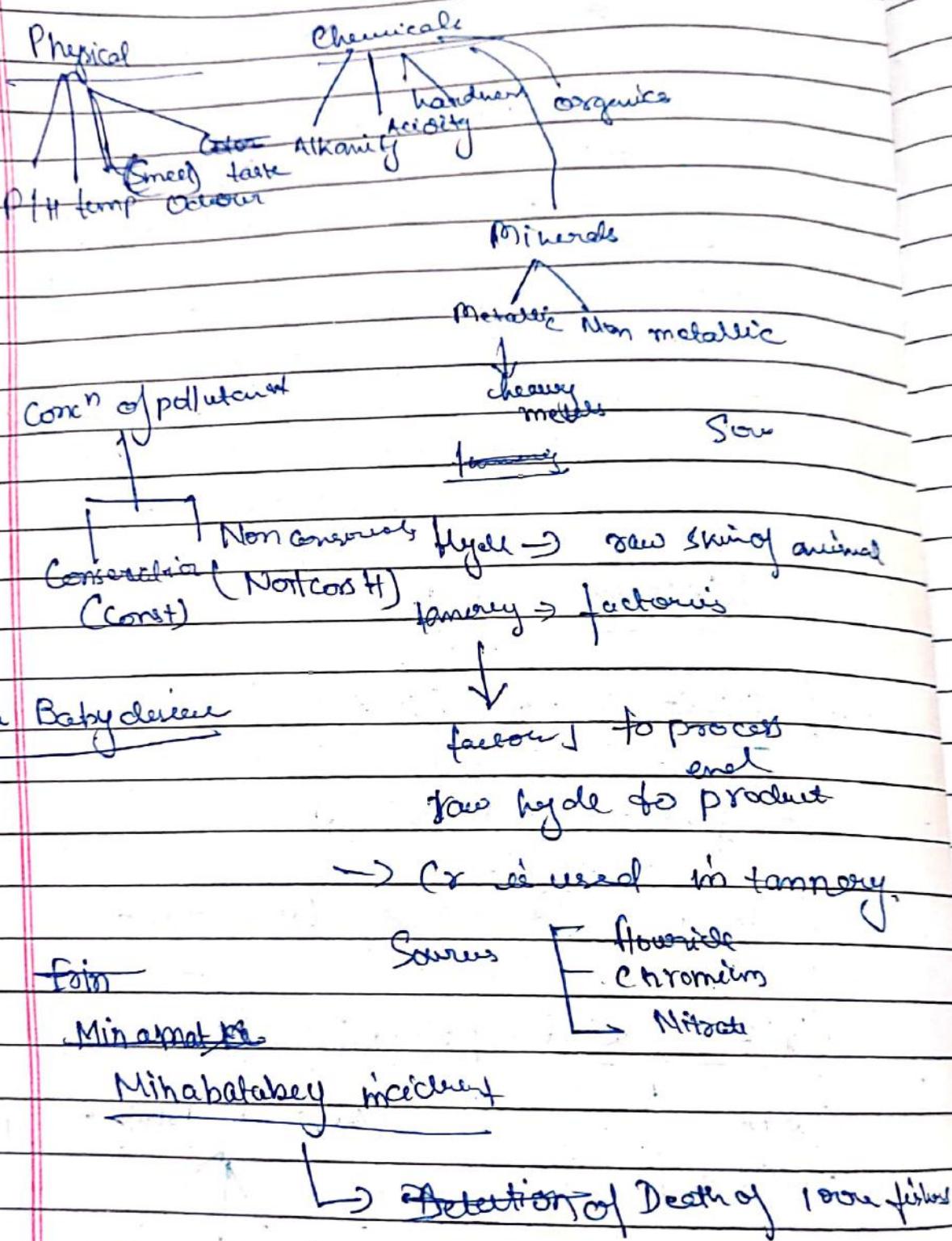
Ecology → Science of living through living

Unit 2 Water pollution

Sources
+
Classification

Physical Pollutants





Defluorination
desulphurization

Nitrate

Unit 1

Human Impact

- Loss of Biodiversity
- Pollution
- Climate Change
- Misuse of Natural Resources
- Acid Rain
- Global Warming
- Erosion

Consequences of Overpopulation

- Pressure on food, Living & Housing
- Unemployment
- Standard of living
- Decrease of forest area
- Environmental pollution
- Education
- Energy crisis
- Hygienic Condition
- Eco degradation

Environmental Issues

- (1) Climate change
- (2) Global warming
- (3) Ozone layer depletion
- (4) Pollution
- (5) Solid waste management
- (6) Deforestation
- (7) Overpopulation

UNIT-4 — ETA

EIA → Environmental Impact Assessment (EIA)
 refers to the evaluation of the environmental impact likely to arise from a major project significantly affecting the environment.

(Change from baseline situation) → Condition in absence of activity caused by an activity.

Types of Impact

| <u>Ecological</u> | <u>Physio-chemical</u> | <u>Impact on Human Interest</u> |
|-------------------|--------------------------|---|
| Eutrophication | Erosion, silting | Loss of agricultural lands, generation of employment opportunities, habitat and local comm. |
| Fisheries | draining / water logging | Commercial and service facilities. |
| Forest | Congestion | |
| Plantation | | |

History →

NEPA

(National Env. Policy Act 1969)

For considering possible impacts prior to a decision being taken on whether or not a proposal should be given approval to proceed.

Environmental Audit (Proof)

Audit \hookrightarrow Process of verifying whatever you are claiming.

→ Acc to USEPA (United State Env. Protection Agency) \hookrightarrow A is a systematic document periodic and objective review by a regulated entity of facility operation and practices related to meeting env. requirements.

Components of Audit \rightarrow Assessment

→ Verification

Water Pollution (first type of pollution which was realised)

W/P
R/S
S/C

→ Water Poll

→ Air Poll

→ Solid

Water Pollution

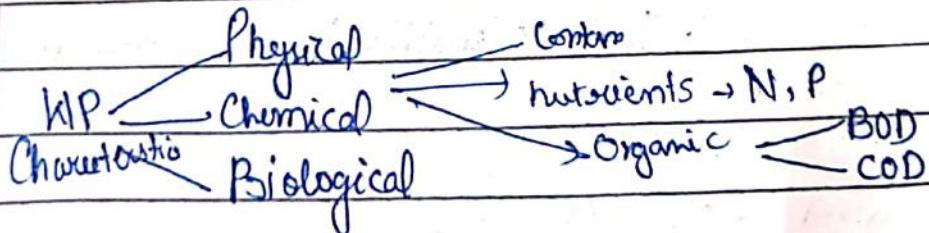
/ /

Surface WP GWPs

Solid Waste

G Waste

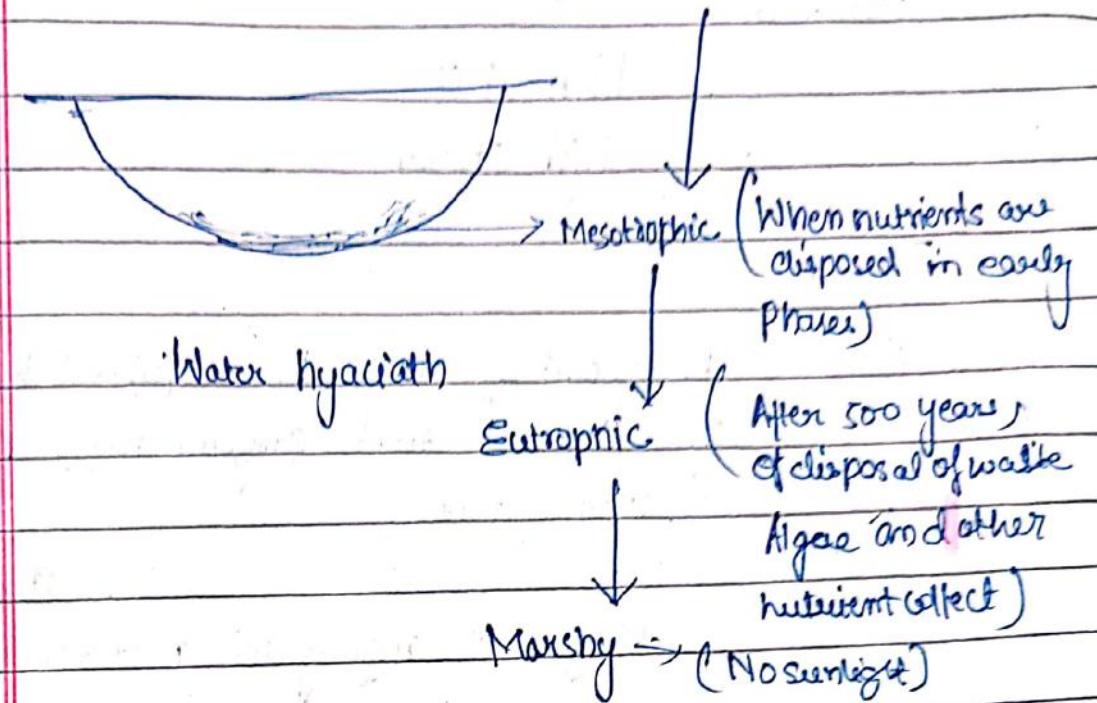
Lappy CP's PD's



Eutrophication \rightarrow Natural aging process of lakes where there is excess of Nitrogen and Phosphorus in Lakes!

Stages of Eutrophication

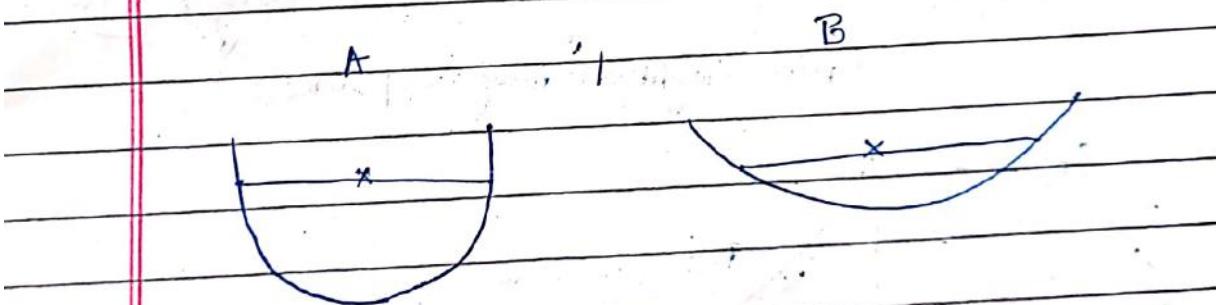
(Pure Lake) → Oligotrophic



BOD → Biochemical Oxygen Demand

COD → Chemical Oxygen Demand

DO → Dissolved Oxygen



If both of them are some river then B should be preferred ⇒

as Dissolved oxygen is a function of velocity, surface area

Self purification capacity of Stream

→ Due to high speed of the streams
continuously flowing, the water itself gets
purified.

→ high DO

→ high Velocity

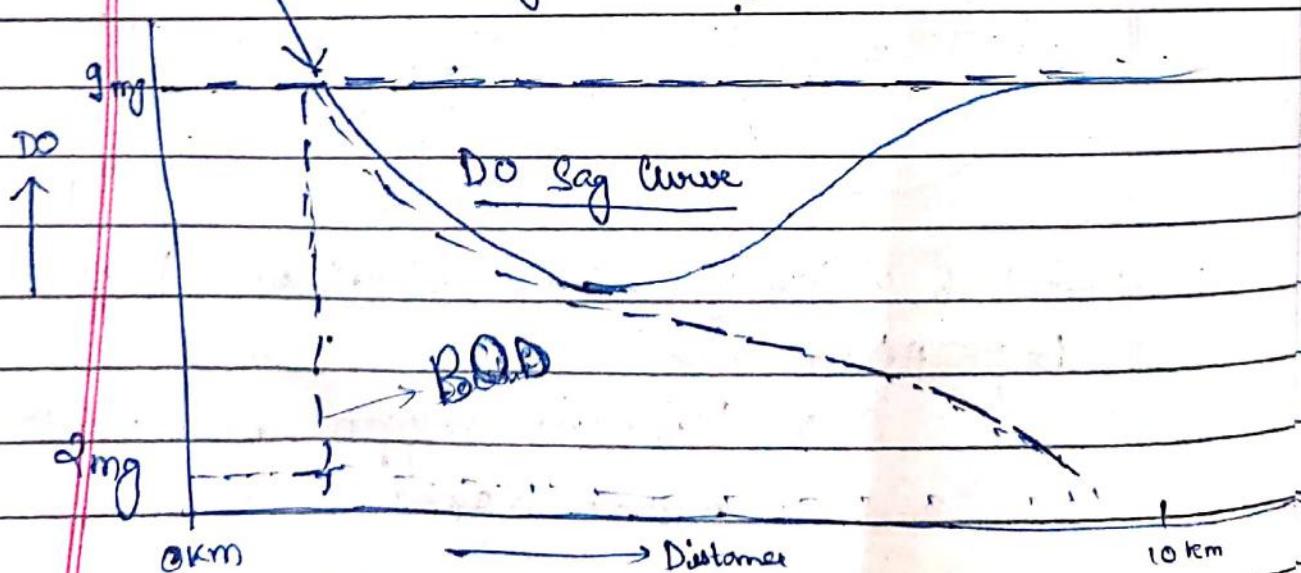
BOD - The amount of Oxygen required to oxidise
the organic and ~~organic~~ matter present
in water water

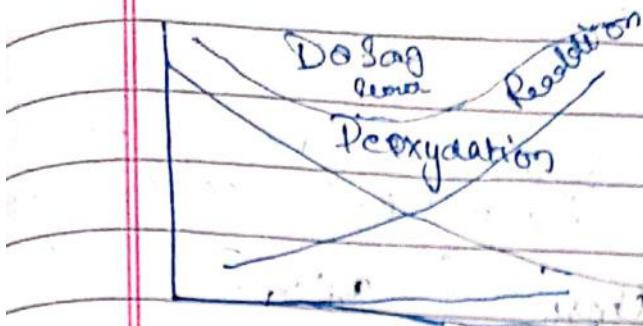
COD - ~~Organic + Inorganic matter~~

DO - Total amount of Oxygen available

Imp. Longitudinal Profile of Dissolved Oxygen [For 11.5]

Drain (high BOD, indigenous particles)





The rate change of DO
is directly proportional

$$\int \frac{dL}{dt} dt = f_t$$

$$L = L_0 e^{-kt}$$

Assignment

(Q1) What are the standard for National ambient air quality standard in India?

(Q2) What is the CPCB guidelines for disposal of treated sewage in India?

CPCB (Central Pollution Control Board)



SPCB (Under ministry of Env. forest)

⇒ CPCB classified Water Bodies based on DBU

Water Bodies (DBU - Designated Bodies)

DO - Signifies cleanliness of water

BOD - Higher the BOD higher contamination

(Amount of organisms dissolved)

↳ Amount of oxygen required to oxidize organisms in the waste water.

Page no.: / / Date: / /

| SNO | DBU | MPN / 100ml | Sample | Classification of Water Bodies based on Desired Best Use Criteria | |
|--------------------------------------|---|-------------|--------|--|---------|
| | | | | Criteria | Surface |
| 1 | DW source w/o conventional treatment | A | | DO ≥ 6 BOD ≤ 2 pH 6.5 to MPN ≤ 500 / 100ml | |
| 2 | Organised Outdoor | B | | DO ≥ 5 BOD ≤ 3 MPN / 100ml ≤ 500 pH 6.5 | |
| 3 | Drinking water source with conv. treatment | C | | DO ≥ 4 BOD ≤ 3 MPN ≤ 5000 pH 6-9 | |
| 4 | Civil life prep. and | D | | pH 6.5 to 8.5 DO ≥ 4 . Free ammonia BOD ≤ 2 ≤ 0.2 | |
| 5 | Toiletion Industry and controlled disposal of waste | E | | pH - 6 to 8.5 EC 2250 milli moles / cm | |
| <u>EC - Electrical conductivity</u> | | | | SAR ≤ 2.5 | |
| <u>SAR - Sodium Absorption Ratio</u> | | | | Proton ≤ 2 | |

DE

On the basis of designated best use criteria (PCV) is classified into 5 categories,

1) Drinking water source without conventional water treatment

2) DO, BOD

DO is an indicator of better health of river system

Higher DO - higher purity level of water

Higher BOD lower or we can say that impure water

BOD → amount of oxygen required to oxidize the organic matter present in pure water:

3) pH

4) MPN (most probable no.) / sample 100 mL

Table: Classification of surface water bodies based on DBU criteria

| DBU | Class | Criteria |
|-----------------------------------|-------|---|
| DW without conventional treatment | A | DO ≥ 6 , BOD ≤ 2 , MPN/100mL ≤ 50 pH $\rightarrow 6.5-8.5$ |
| Organised outdoor bathing | B | DO ≥ 5 , BOD ≤ 3 , MPN/100mL ≤ 50 pH $\rightarrow 6.5-8.5$ |
| DW with conventional treatment | C | DO ≥ 4 , BOD ≤ 3 , MPN/100mL ≤ 50 pH $\rightarrow 6.5-8.5$ |
| wildlife propagation | D | DO ≥ 4 , BOD ≤ 2 free ammonia (as N) ≤ 0.2 pH $\rightarrow 6-9$ |
| Irrigation | E | pH $\rightarrow 6-8.5$ Electrical conductivity (EC) $\rightarrow 2250 \mu\text{mho}/\text{cm}$ SAR ≤ 25 (Sodium absorption ratio) Baron ≤ 2 |

DI:

Proper
when
it is
Sed

OE

self purification capacity of streams
waste water treatment →
physical separation of suspended solid; followed
by removal of dissolved / colloidal matter using
indigenous microbes
↓
your own

Natural processes

1) Physical forces

↓ dilution and dispersion

↓ sedimentation

↓ Sunlight (photosynthesis)
 $O_2 \uparrow \uparrow$

2) Chemical forces aided by biological forces

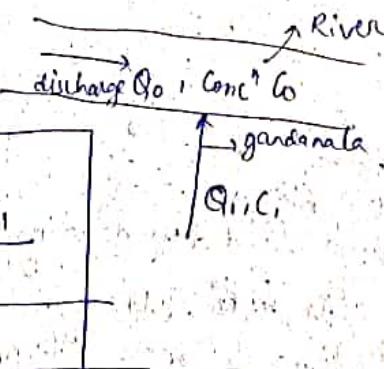
* Oxidation

* Reduction

⇒ Law of dilution ↓

$$Q_0 C_0 + Q_1 C_1 = Q_2 C_2$$

$$C_2 = \frac{Q_0 C_0 + Q_1 C_1}{Q_2}$$



Inland drainage → Those rivers which do not meet up a sea.

Diffusion

Property of pollutants (solute)
when there is conc. gradient
it is diffusion

Dispersion

Property of medium (solvent)
it is contained of velocity

Sedimentation, to take place velocity tends to zero.

velocity of Yamuna at Delhi = $0.2 \frac{\text{km}}{\text{hr sec}}$
benthos (oxygen required by these) is called
benthic oxygen demand)

Aeration

- 2) Organised outdoor ghat barrier bathing
- 3) Drinking water source with conventional treatment
- 4) Wildlife propagation and fisheries
- 5) Irrigation, industrial purpose, control disposal of wastewater