SNS COLLEGE OF TECHNOLOGY

Vazhiamyampalayam,Coimbatore-35

(An Autonomous institution)

Accredited by **NBA-AICTE** and Re-Accredited by **NAAC-UGC with A+ Grade**

Approved by **AICTE,** New Delhi & Affiliated to **Anna University**, Chennai

DEPARTMENT OF CHEMISTRY

COURSE NAME : 19HST101- ENVIRONMENTAL SCIENCE

I YEAR / I SEMESTER

UNIT : 3. ENVIRONMENTAL POLLUTION

TOPIC : 2. AIR POLLUTION
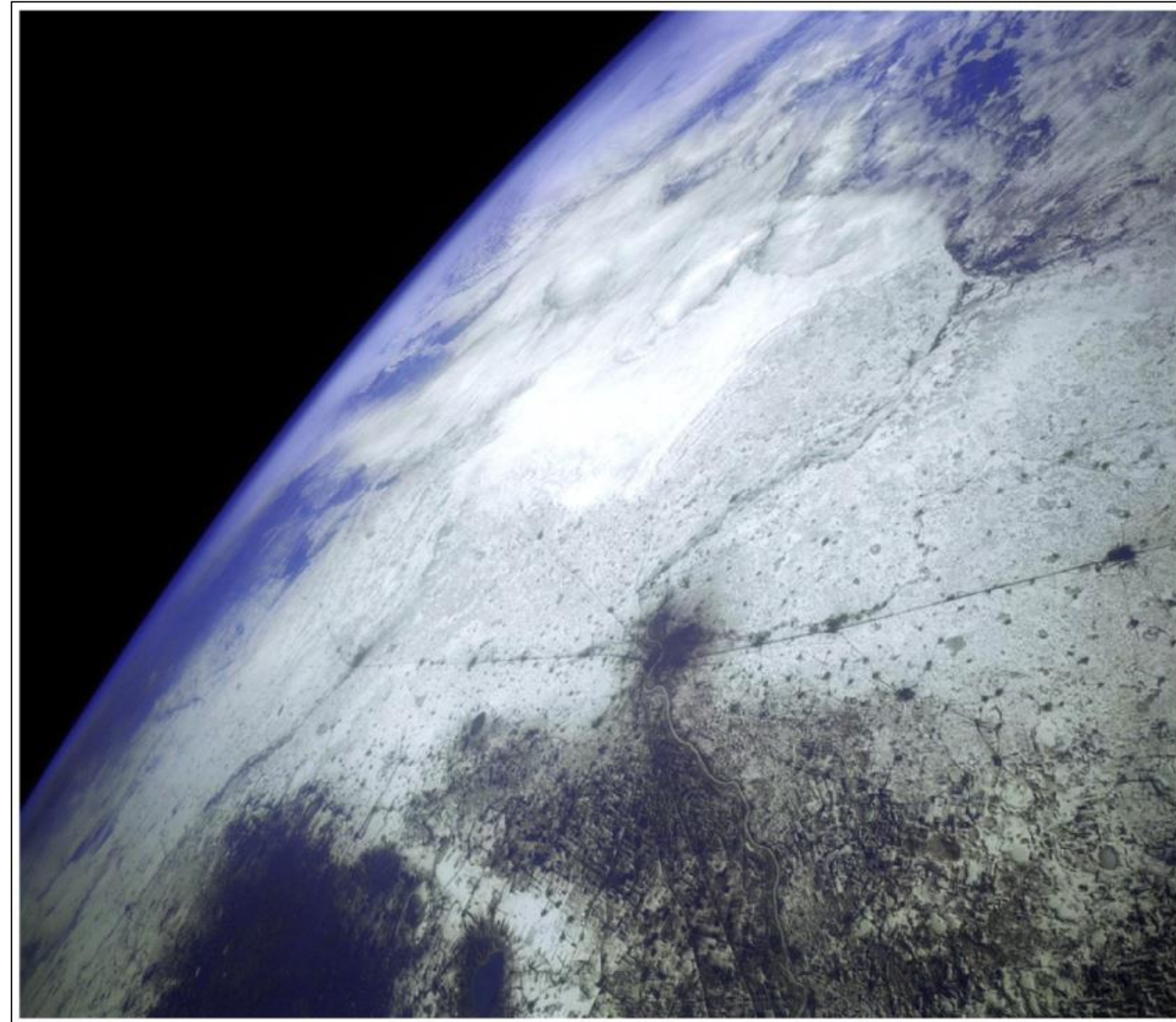
BRAINSTORMING WITH RECAP

INTRO

- **Atmospheric Composition**
- Nitrogen 78.08%
- Oxygen 20.95%
- Argon 0.93%
- Carbon dioxide 0.04%
- **Ecosystem services**
- Blocks UV radiation
- Moderates the climate
- Redistributes water in
- the hydrologic cycle

Air Pollution-Definition

- Chemicals added to the atmosphere by natural or human activities in high enough concentrations to be harmful
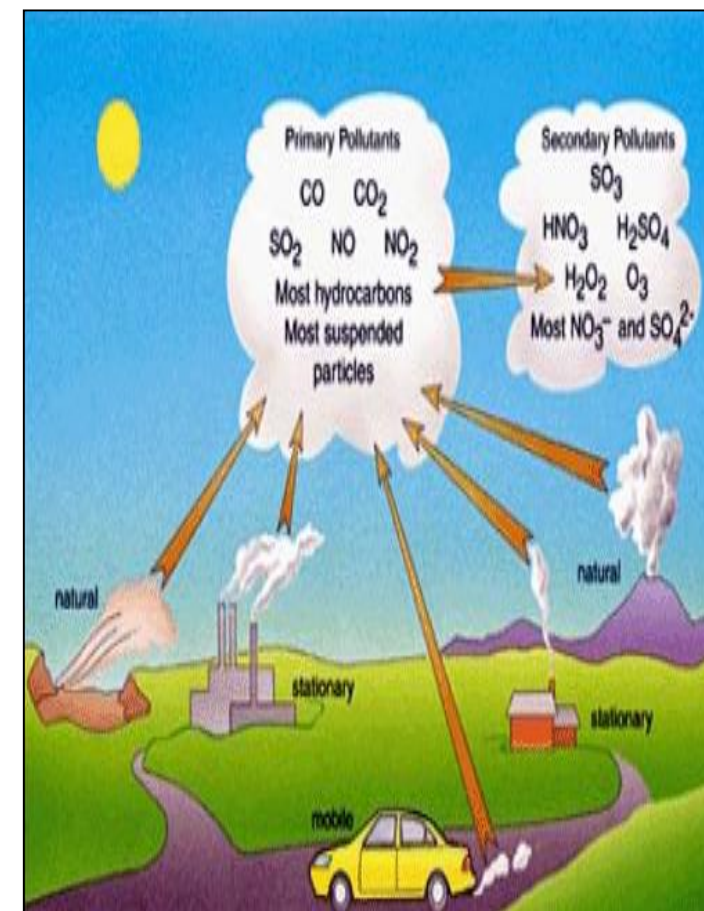
Types

1.Primary Air Pollutant

- Harmful substance that is emitted directly into the atmosphere(Originate from natural process)

2. Secondary Air Pollutant

- Harmful substance formed in the atmosphere when a primary air pollutant reacts with substances normally found in the atmosphere or with other air pollutants
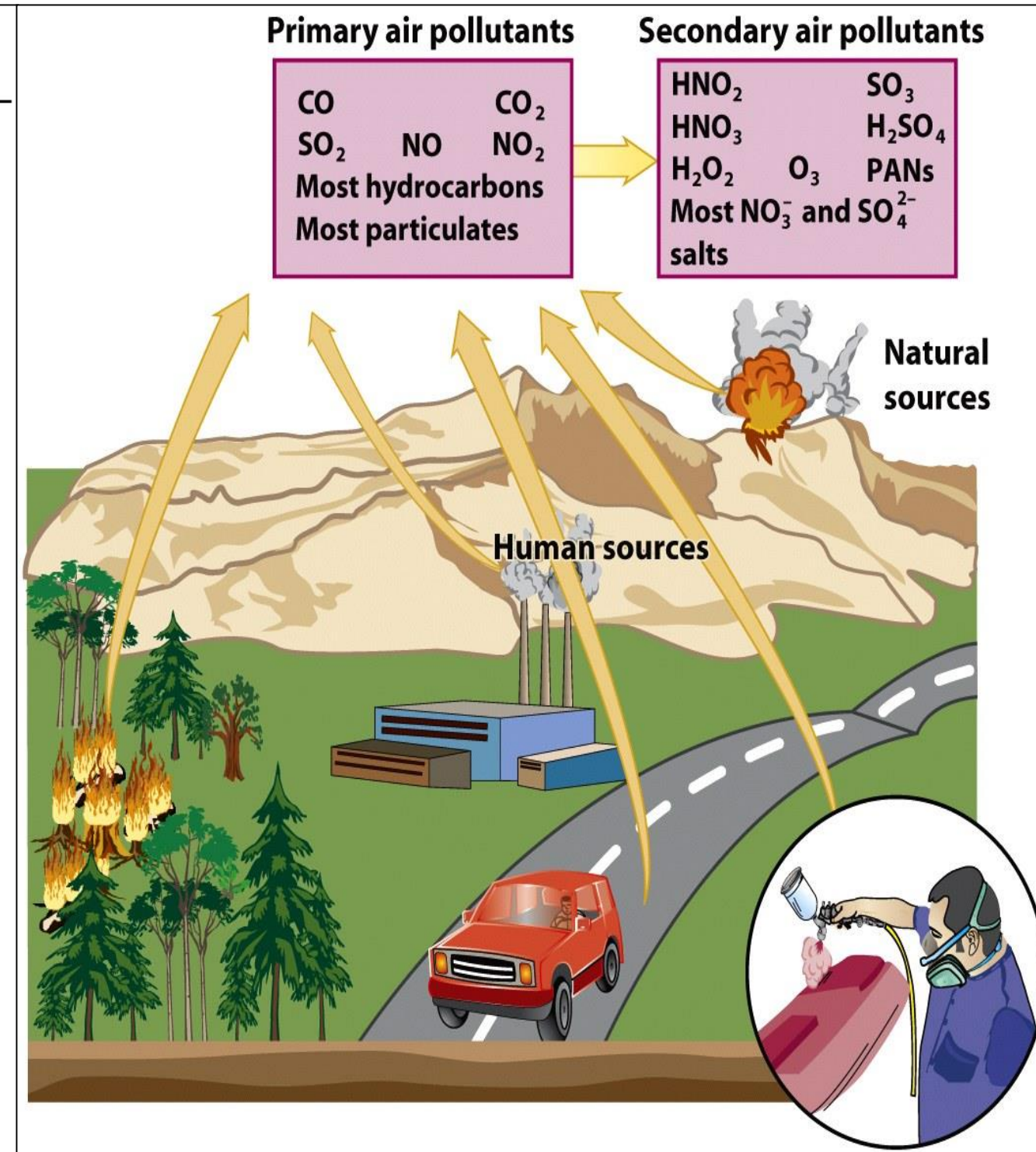
MAJOR AIR POLLUTANTS

Pollutant	Composition	Primary or Secondary	Characteristics
Particulate matter			
Dust	Variable	Primary	Solid particles
Lead	Pb	Primary	Solid particles
Sulfuric acid	H_2SO_4	Secondary	Liquid droplets
Nitrogen oxides			
Nitrogen dioxide	NO_2	Primary	Reddish-brown gas
Sulfur oxides			
Sulfur dioxide	SO_2	Primary	Colorless gas with strong odor
Carbon oxides			
Carbon monoxide	CO	Primary	Colorless, odorless gas
Carbon dioxide*	CO_2	Primary	Colorless, odorless gas
Hydrocarbons			
Methane	CH_4	Primary	Colorless, odorless gas
Benzene	C_6H_6	Primary	Liquid with sweet smell
Ozone	O_3	Secondary	Pale blue gas with acrid odor
Air toxics			
Chlorine	Cl_2	Primary	Yellow-green gas

Primary air pollutants

CO CO_2
SO_2 NO NO_2
Most hydrocarbons
Most particulates

Secondary air pollutants

HNO_2 SO_3
HNO_3 H_2SO_4
H_2O_2 O_3 PANs
Most NO_3^- and SO_4^{2-} salts

Natural sources

Human sources

SOURCES & EFFECTS

Pollutant	Anthropogenic sources	Effects on human health
SO_2	Combustion of fossil fuel	Respiratory disorder, visibility impairment
NO_2	Biomass & fossil fuel burning	Respiratory disorder
CO	Exhaust of internal combustion engines	Respiratory disorderAnomexis, Cardiovascular problems
NH_3	Fertilizer industry	Respiratory disorder, skin & eye irritation
O_3	Reaction of sunlight on air containing hydrocarbons and NO_x	Respiratory disorder, Cardiovascular problems
Pb	Automobile exhaust, Cosmetics, firewood burning, tobacco, batteriesWaste incineration, Metal processing, Paint,	Effects on CNS, cardiovascular system, kidneys, immune system, miscarriage & reduction of fertility
Ni	Combustion of fossil fuels, Nickel plating, Metallurgical processes	Allergy, dermatitis
As	Combustion of fuels, Smelting of metals, glass prodction,	Multi-system organ failure, poisoning, epigenetic changes,

SOURCES & EFFECTS

| Pollutants	Anthropogenic sources	Effects on human health
C_6H_6	Combustion of fossil fuel	Reproductive effects, Neurotoxic, Hematotoxic, leukemogenic, carcinogenic,
PAH	Incomplete combustion of fuels	Respiratory disorder, mutagenic, carcinogenic effects
PM_{10}	Vehicular emission, Road traffic emissions, industrial combustion, agricultural burning	Respiratory disorder, Cardiovascular problems
$PM_{2.5}$	Vehicular emission, Industrial & residential combustion, Biomass burning, thermal power plants	Respiratory disorder, Cardiovascular problems , Oxidative stress, Systemic & immune alterations , Genotoxicity Neurotoxicity, Reprotoxicity

PHOTOCHEMICAL SMOG

Brownish smoke appeared in large cities with significant amount of traffic in the presence of sunlight
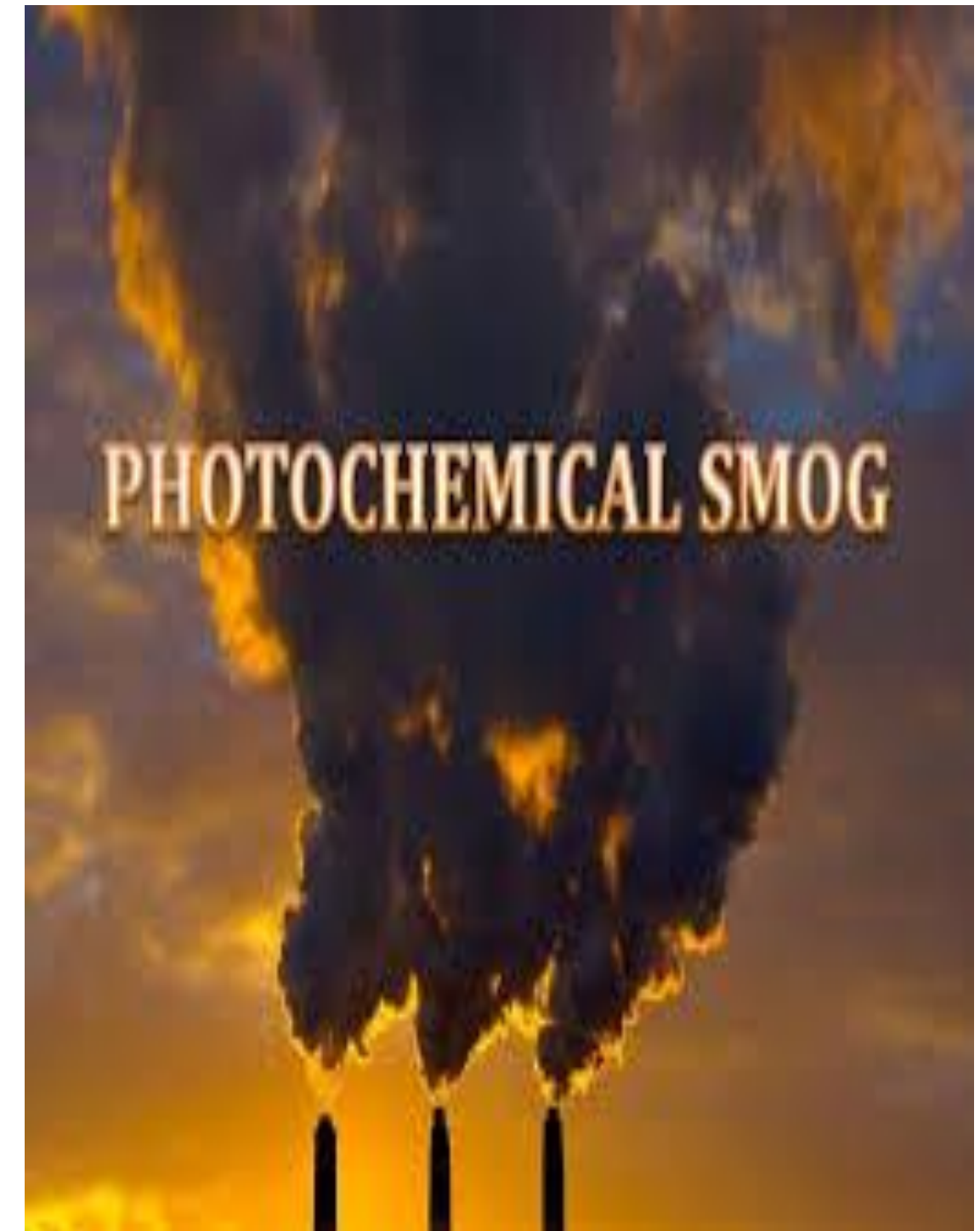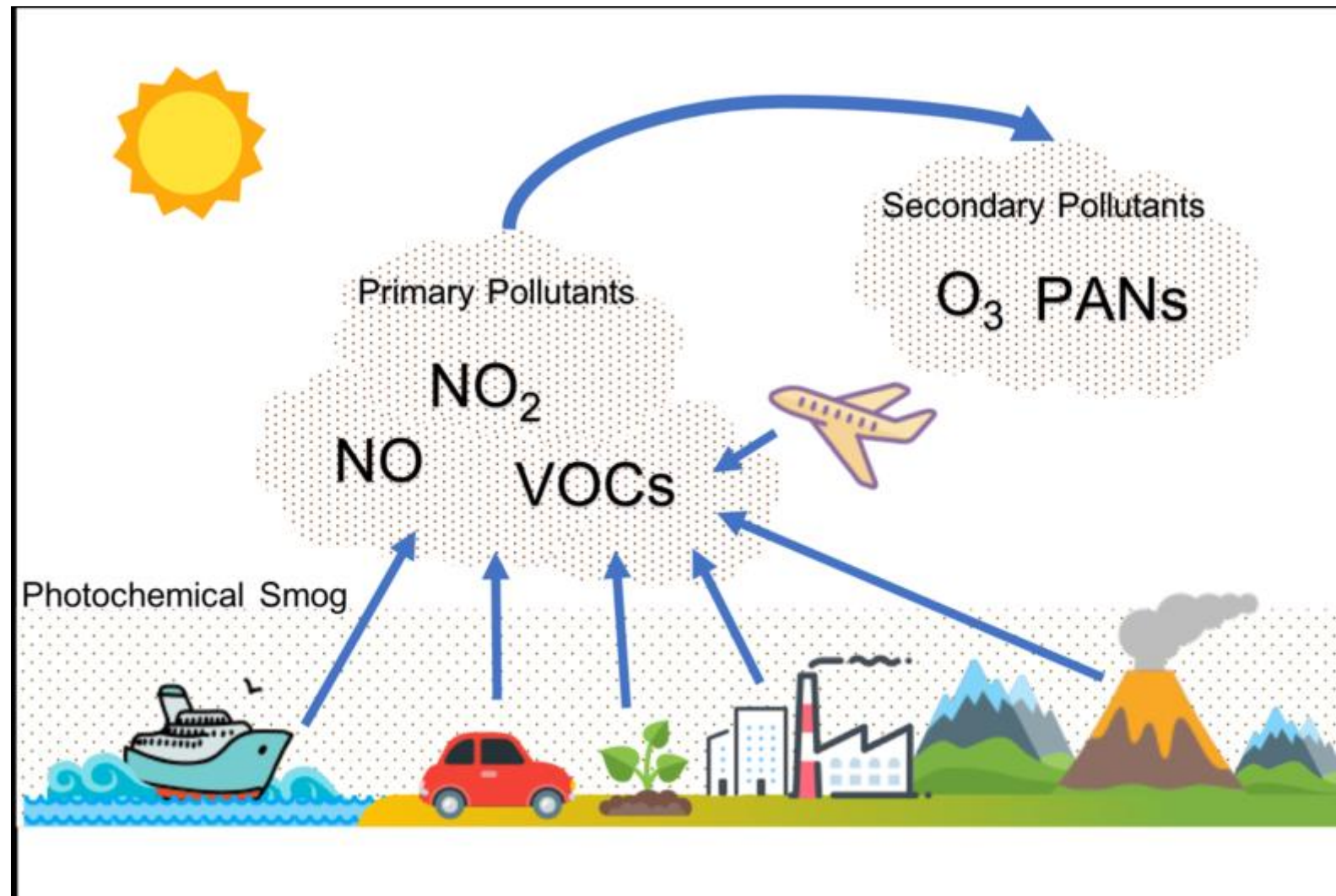
INDIAN AMBIANT AIR QUALITY STANDARDS

Air Quality std

- Legal limits, placed on the conc. of air pollutants in a community where people & things are exposed

Ambient Air Quality std

- Permissible exposure of all living & non living things for 24 hrs, 7 days /week (24x7)/wee

Pollutants	Time-weighted average	Concentration of ambient air (in $\mu g/m^3$)		
		Industrial area	Residential rural	Sensitive area
SO_2	Annual average	80	60	15
	24 h	120	80	30
NO_2	Annual average	80	60	15
	24 h	120	80	30
SPM	Annual average	360	140	70
	24 h	500	200	100
RSPM	Annual average	120	60	50
	24 h	150	100	75

CONTROL MEASURES

1.Source control

- Use unleaded petrol

- Use low content S of S & ash in petroleum product

- Use public vehicle

- Schools, restaurants, children play area away from busy area

- Plant more trees

- Prefer recycling

- Use catalytic convertor

CONTROL MEASURES

2.Control measures from industries

- The permission rate should be restricted

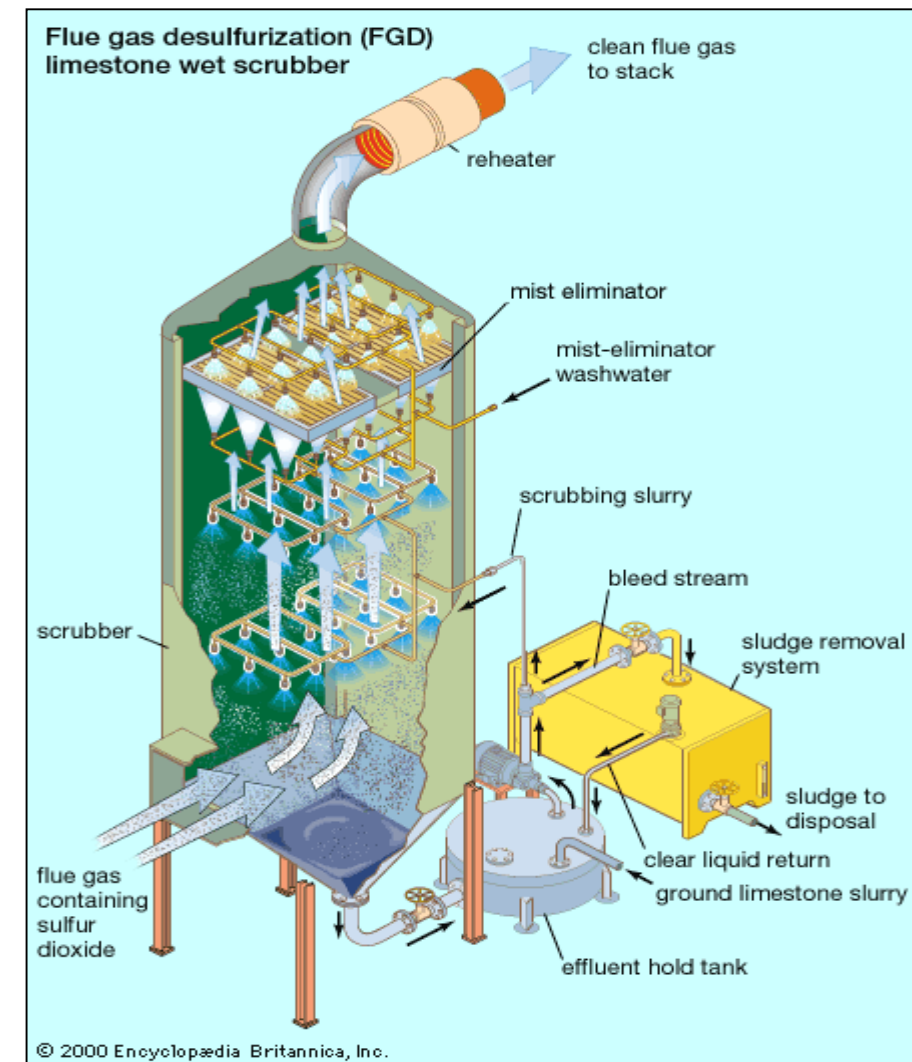- Well designed plant & equipment's made mandatory
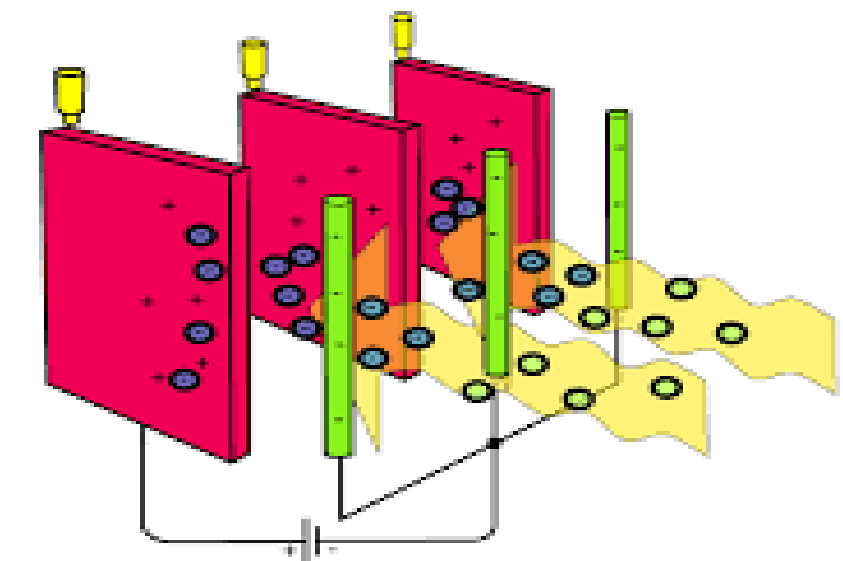
- Continuous monitoring

CONTROL MEASURES

2.Control measures from industries

- The following equipment's used to reduce the air pollution

Flue gas desulfurization (FGD) limestone wet scrubber

clean flue gas to stack

reheater

mist eliminator

mist-eliminator washwater

scrubbing slurry

bleed stream

sludge removal system

scrubber

sludge to disposal

clear liquid return

ground limestone slurry

flue gas containing sulfur dioxide

effluent hold tank

© 2000 Encyclopædia Britannica, Inc.

ELECTROSTATIC PRECIPITATOR DIAGRAM

List out the various sources & effects of air pollutants

SUMMARY

REFERENCES

1. Dr. A.Ravikrishnan, Environmental science & Engineering" Srikrishna hitech Pub. Co. Ltd,2013.

2. G.Tayer Miller :Environmental Science", Cenage Learning India Pvt Ltd, 2011.

3. Benny joseph, "Environmental science & engineering" Tata McGraw-Hill.Pub.Co.Ltd. New Delhi.2009.