

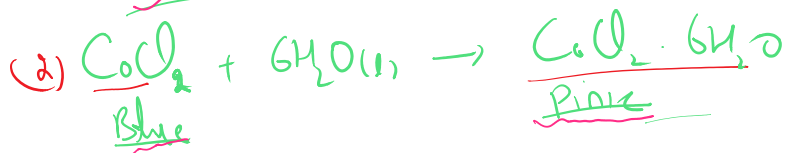
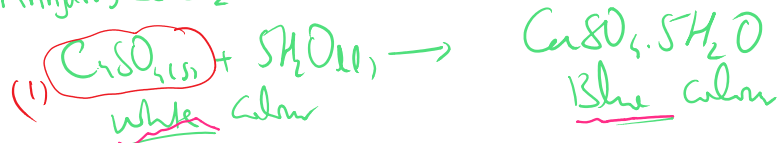
Water

Air

Chemical test for water

Anhydrous CoCl_2

Anhydrous CuSO_4



Purity of Water

Bobs at 100°C
freezes at 0°C

If I added salt + H_2O
B.P 103°C B.P 106°C
M.P -1°C
Your water is pure

Distilled water use in Labs

Tap water and Distilled H_2O

If we are using tap water the nutrients or ions can interfere with our chemical test.

if we use distill water we remove the interference of these nutrients/ions or impurities

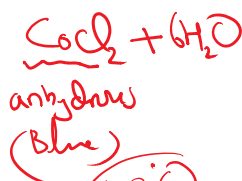
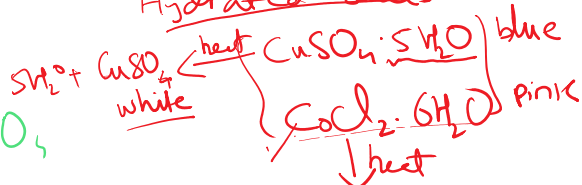
Water from the Natural sources contain

(1) Dissolved O_2
water is a good solvent so river water contain dissolved O_2 and N_2 from the air. (Harmful gas from engines, power station and factories) x

(2) Metal Compound
Metal compounds are also carried to rivers in effluent from mines and factories

hydrated salt
anhydrous

Hydrated salts



103°C
B.P = 100°C
M.P = 0°C
 $-1^\circ\text{C}, -2^\circ\text{C}$

deionized
without ions.

blue gas

effluent
(liquid waste)

Metal compounds are also found in effluent from mines and factories. Some come from sewage works.

effluent
(liquid waste)

Mercury (Hg)

(3) Sewage In some places sewage and used H_2O from homes is piped to sewage treatment. Liquid part is cleaned. It still contains soluble compounds. e.g. phosphate from shampoos and detergents.

phosphate
shampoos

(4) Plastic is dumped by human and wind.

closed

(5) Microbes (microorganisms / bacteria) fungi. Untreated sewage (human waste / used H_2O) is disposed by letting it seep into the soil. From there it may drain into the rivers.

(Cholera + Typhoid)

(6) Nitrates from fertilizers. Nitrates and phosphate → shampoos

Beneficial Substances

(1) Dissolved Oxygen

Fishes ~~swim~~ require this dissolved O_2 . Fish and other aquatic life is dependent on dissolved O_2 .

(2) Metal Compounds

Our body needs ions of around 21 elements. e.g. Ca is needed for strong bones and teeth.

Mg + Ca helps in protecting heart increases.

Na, K, Fe, Cu, Zn, F

River water contains different amounts of these essential elements / minerals depending on rocks in river basin. They reach us in drinking.

Water and Woods

Harmful substances

- (1) Toxic Metals <sup>They come from factories
waste, from mines.</sup>
- Lead Pb Arsenic As Mercury Hg

Brain damage increases the risk of Cancer and heart disease damage the nervous system

- (2) Plastic

harm the fish by clogging their feet and they starve to death.
Plastic never degrades

- (3) Untreated Microbes

→ Cholera

→ Typhoid

- (4) Nitrates and phosphates



Fertilisers detergents shampoos

If nitrates and phosphates are too much in water they will - cause eutrophication
Promote the growth of small plants called algae, taking up the dissolved O_2 and creating the problem for other aquatic life.

Treatment of Domestic ~~water~~ Water Supply.

(1) Cleanest source
e.g. clean stretch of river
aquifer (boreholes)

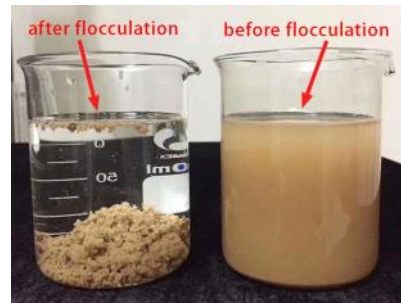
(2) Filtration and Sedimentation small stones
Filter the water through clean gravel
or sand.
Let the particles settle down at the
bottom of the tank. This process is
called sedimentation

(3) Flocculation

Add something to the tank to
make the particles stick together, you
can easily skim off the pure water

(4) Use of Carbon to remove taste and odour
 H_2S rotten egg smell

Carbon in charcoal



Carbon contains charcoal, wood, coconut
shells. These granules have very fine
pores giving large surface area to
adsorb the nasty substances on it

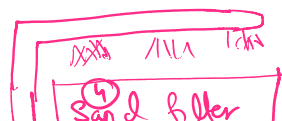
(5) Chlorination

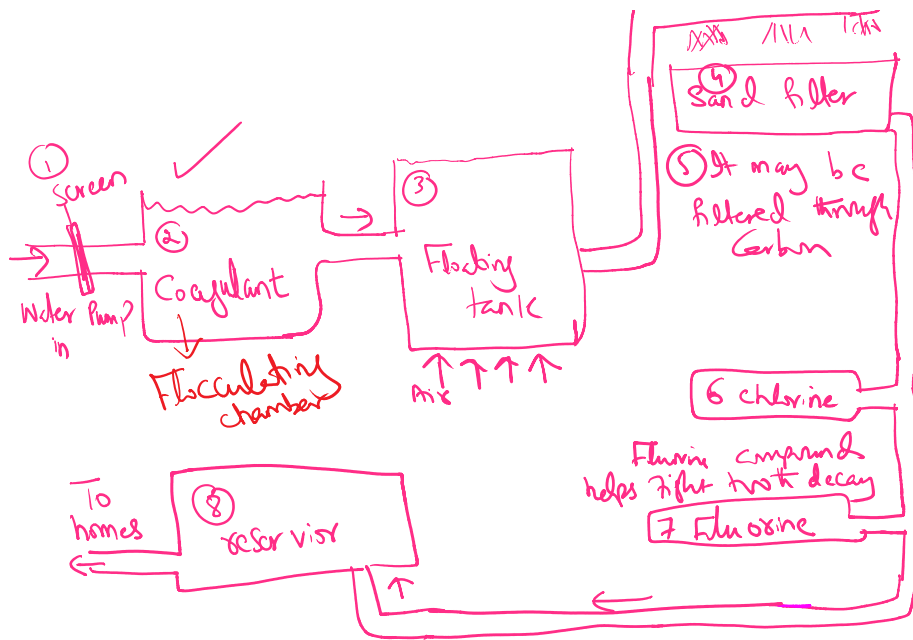
kill the microbes

In modern treatment plant

Coagulant is added e.g. Iron (III) Sulphate
 $Fe_2(SO_4)_3$. It makes fine suspended particles

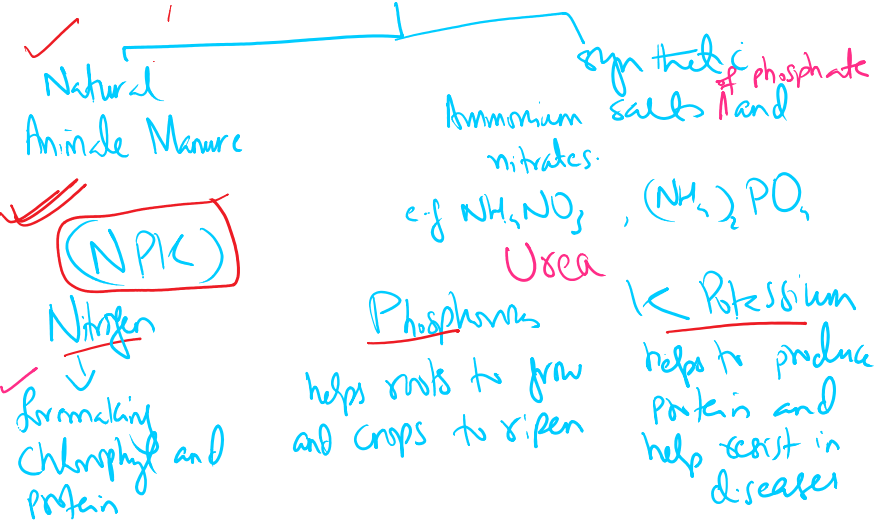
clump together (flocculate). Some toxic metal
compounds will stick to the clumps.





This treatment can remove even tiny solid particles. Step (2) and step (5) remove toxic metal.

Fertilizers increase the crop production. is a substance added to soil to make it fertile.

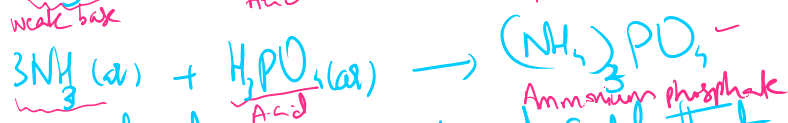
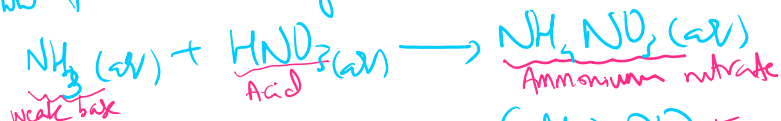


◀ Getting ready to spread fertiliser on fields. This is an NPK fertiliser. The numbers 6.17.15 on the bags tell you that it is 6% nitrogen, 17% phosphorus and 15% potassium by mass.

How to make synthetic fertiliser

$$\text{NH}_3 + \text{HNO}_3 \rightarrow \text{NH}_4\text{NO}_3 \text{ (a.v.)}$$

How to make synthetic fertilizers



(NPK) fertilizers is mixture of salt that provide all three element, plant needed

Air Quality and Climate

21% O_2
78% N_2

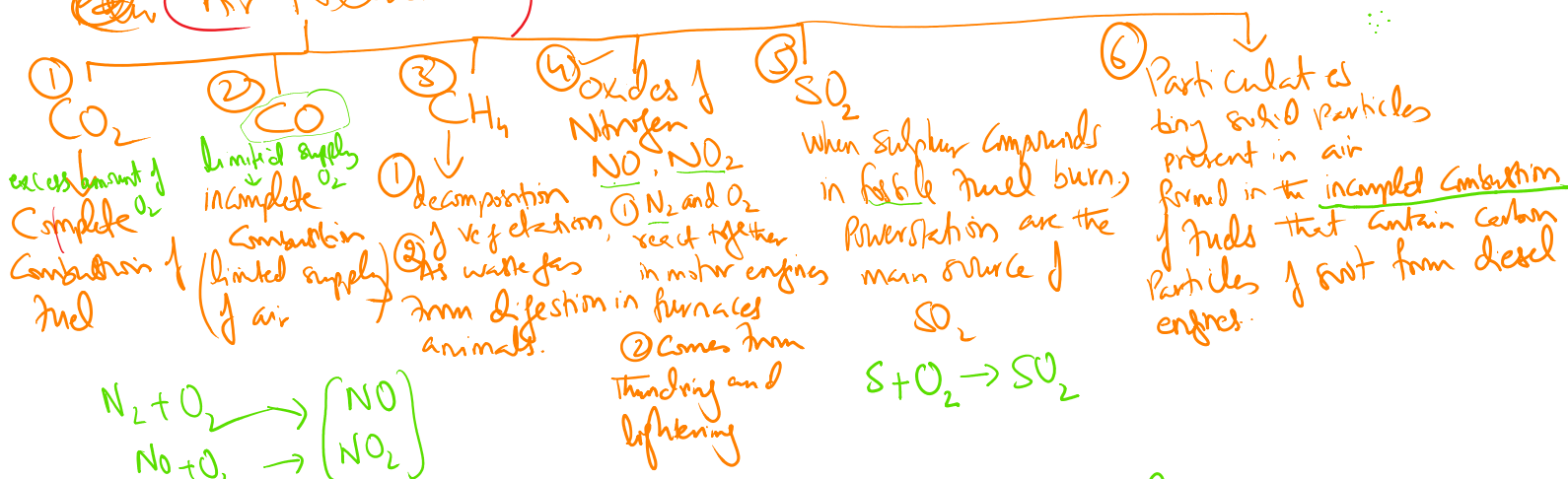
1% Noble gases, CO_2 , Water vapour.

1% Argon, CO_2 , He, Ne, Kr, Xe
Small amount of H_2O

But the air around us is not clean

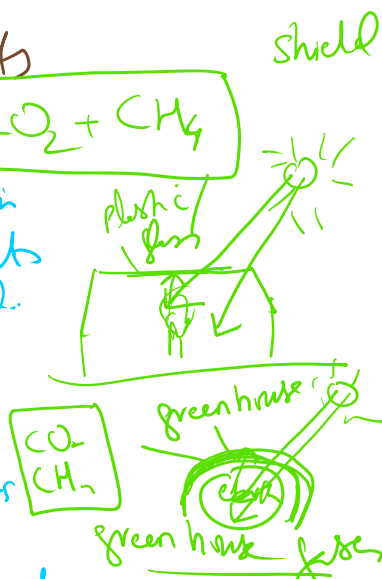
Air Pollutant

CO is silent killer
(1) colourless
(2) odourless



Harmful effects of these pollutants

- ① CO_2 → Global warming
- ② CO → Poisonous / toxic for even in low concentration it reacts with haemoglobin in blood.
- ③ CH_4 → Global warming
- ④ Oxides of Nitrogen → Cause respiratory problems, dissolve in rain to give acid rain.

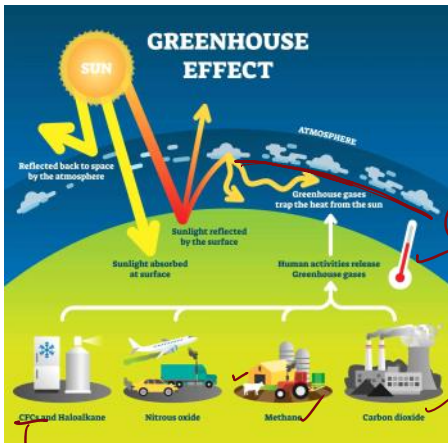


NO_2 is brought down rain, form photochemical smog
 (brown haze)
 because UV light (sun) reacts with them.

⑤ SO_2 $\xrightarrow{\text{H}_2\text{SO}_4}$ It cause acid rain, attacks stone of the building especially limestone and marble (CaCO_3)
 Stone Cancer
 Kill fishy making water acidic for them.

⑥ Particulate $\rightarrow$ Cause respiratory Problems
 Cause Cancer.

Green House gases CO_2 and CH_4



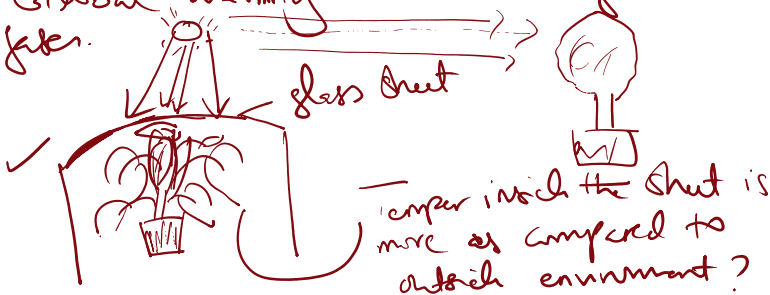
① Sun rays reach the earth and get absorbed by earth.

② These UV rays warm our Earth and reflect the surplus one again as a heat (thermal energy)

~~Thyrofluorocarbon (A/C Refrigerator)~~

Damaging the ozone layer (saves us from the harmful radiation)

Global warming is due to green house gases.



✓ Sunlight when enters the sheet, will not reflect back

(CO_2 , CH_4) - Glass sheet of the

green house

~~Strategies to reduce the effects of~~

Strategies to reduce the effects of

Environmental issues

If you are using Carbon fuel it will make more and more CO_2 , CO



① ^{Use} Non Carbon fuel

generate the electricity

We can use

(1) Turbines, tides, Wind, waves
electricity generated by using
rivers is called Hydroelectricity

(2) Wind Mills

(3) Nuclear Power Stations

U-235 U-238

(4) Solar Power

in transport system

① Batteries

which can be
charged.

② Hydrogen - Oxygen
Fuel Cell

It produce harmless
product i.e H_2O

② Planting Trees

Avoid deforestation healthy
forest



Carbon dioxide + water $\xrightarrow{\text{sunlight}}$ Glucose + oxygen

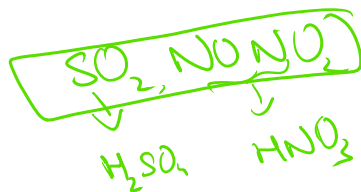
③ Reduction in Livestock Farming

To reduce methane, farmers need to rear
fewer of these animals and we need to
change our eating habits. We can eat fish
and chicken only and avoid meat.

Increase the proportion of plant based food
in our diet.

Q Acid Rain Problem.

SO₂, oxides of Nitrogen

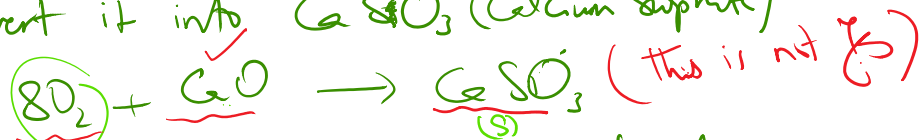


(1) Using low sulphur fuels

(2) Flue gas desulphurisation

In this process flue gases from power stations are treated with CaO (lime)

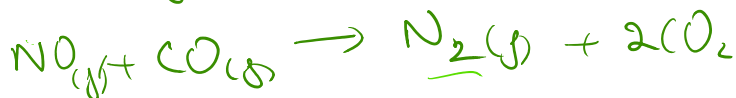
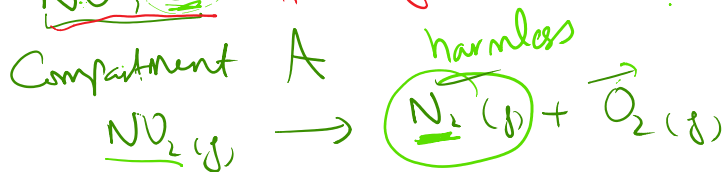
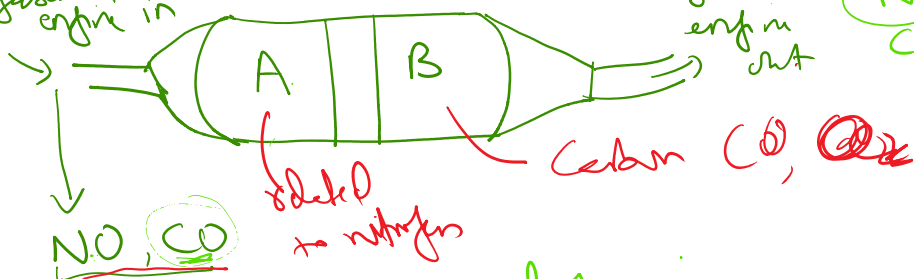
It reacts with SO₂ gas and convert it into CaSO₃ (Calcium sulphite)



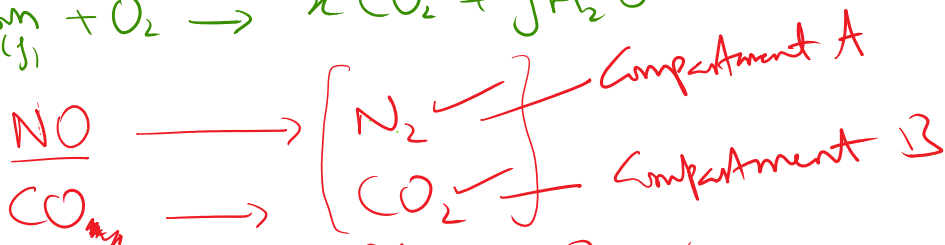
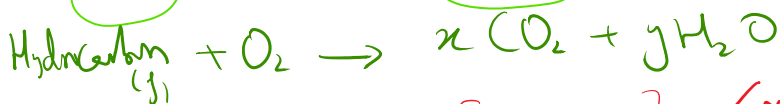
(3) Use Catalytic Converters in Vehicles

gases from engine in

gases from engine out



Compartment B



flow out from the exhaust ~~pipes~~ pipes

Why it is called Catalytic Converter

Catalysts are used i.e. platinum, rhodium and palladium (Transition element). These catalysts are coated on ceramic honeycomb beads to give large surface area for the reaction.