



Government of Tamilnadu

Department of Employment and Training

Course : TNPSC Group II Exam
Subject : Chemistry
Topic : **Nitrogen and Its Compounds**

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**Commissioner,
Department of Employment and Training.**

NITROGEN AND ITS COMPOUNDS

❖ 15th group elements include Nitrogen, Phosphorus, Arsenic, Antimony and Bismuth.

❖ All the above elements have the general electronic configuration is $ns^2 np^3$.

- Symbol : N
- Atomic Number : 7
- Mass Number : 14
- Valency : 2, 5

❖ Rutherford in 1772 discovered Nitrogen.

❖ Air contains $\frac{3}{4}$ part of elementary Nitrogen.

❖ Nitrogen is a essential for plant and animal proteins.

❖ Nitrogen as a compound state in the salt peter, chile salt petere and ammonium salts.

Fixation of nitrogen

❖ The nitrogen present in the atmosphere is free (or) elementary nitrogen. The conversation of free atmospheric nitrogen to a nitrogen compound is called fixation of nitrogen.

Methods employed for fixation (or) brining atmospheric nitrogen into combination

❖ A mixture of nitrogen and hydrogen in the ratio 1 : 3 under pressure (200-900 ppm) is passed over a catalyst, finely divided into iron and molybdenum as promotor, heated to about 770K.

Nitrogen fixation in nature

❖ Due to electrical disturbances atomospheric nitrogen and oxygen combine to give Nitric oxide.

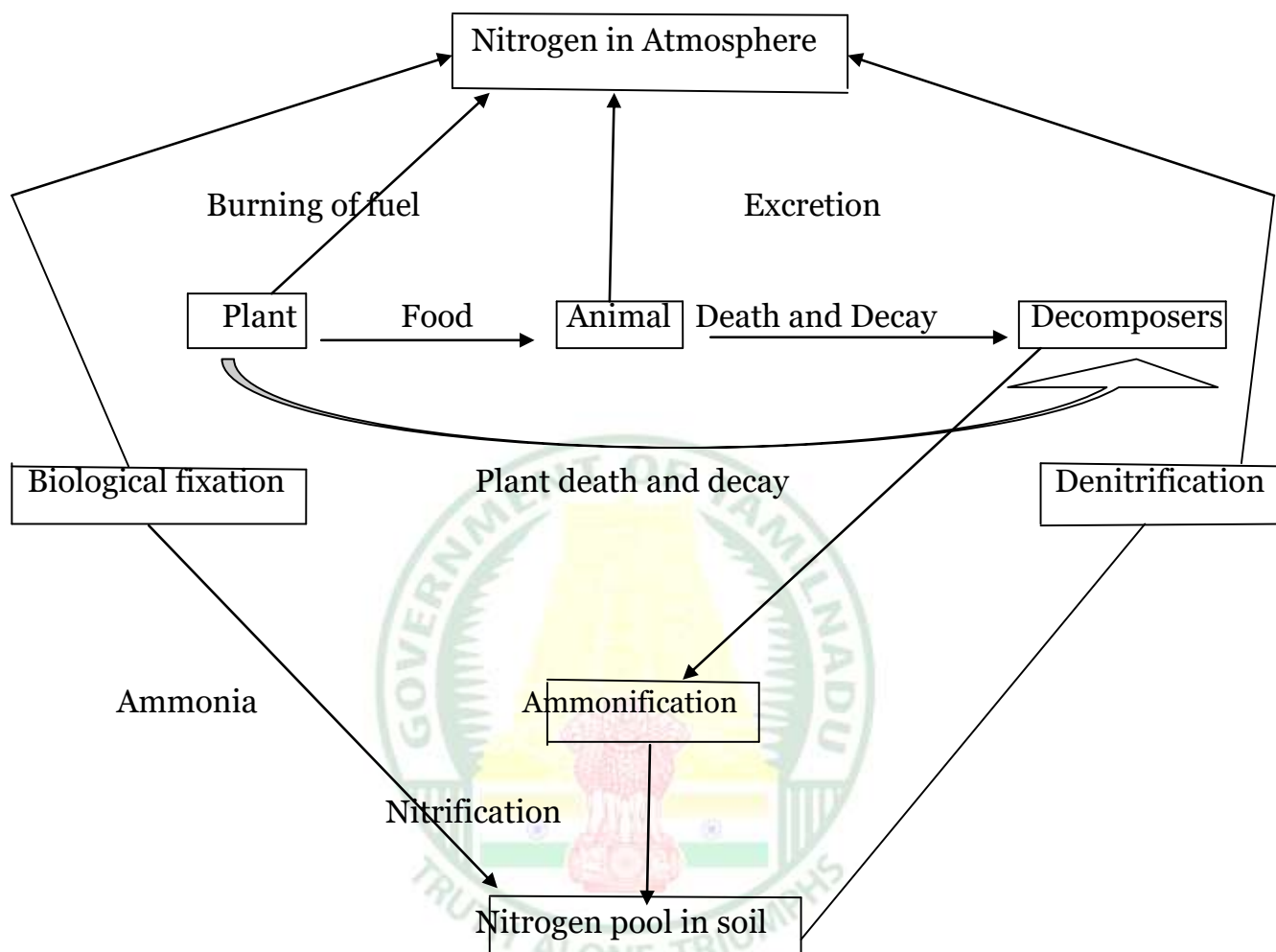
❖ Nitric oxide is further oxidised to give nitrogen dioxide.

❖ Nitrogen dioxide reacts with rain water in the presence of oxygen to produce nitric acid.

❖ Nitric acid reacts with bases of the soil to give nitrates.

In addition to this, certain bacteria living in the nodules on roots of leguminuous plants. Eg. pea, beans etc. Convert nitrogen into nitrogenous compounds which can be directly assimilated by the plant.

NITROGEN CYCLE



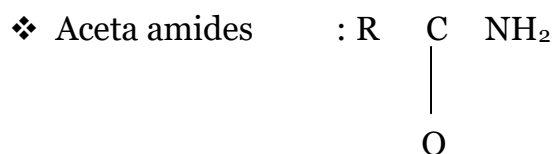
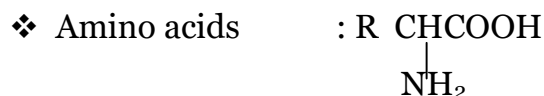
Organism involved in nitrogen cycle

1.	Nitrogen fixation	Rhizobium, Azetobacter and Nostoc
2.	Ammonification	Ammonifying bacteria and fungi
3.	Nitrification	Nitrosomonas and Nitrobacter
4.	Denitrification	Pseudomonas

Nitrogen compounds

- ❖ Nitriles C : N
- ❖ Nitro compounds : NO₂
- ❖ Amines : NH₂
- ❖ Diazonium salts : N₂Cl

♦.....♦ NITROGEN AND ITS COMPOUNDS ♦.....♦



❖ It is a highly corrosive strong mineral acid.

Preparation

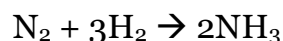
❖ Chile salt peter's method – by NaNO_3

Nitrogen compounds

1. Ammonia (NH_3)

❖ Ammonia is a basically colourless and a strong smelled gas like onion.

Preparation



Uses

1. Liquefied ammonia is used in freezing ice in the refrigerators
2. Ammonia is used in the production of ammonium salts and urea.
3. In the production of nitric acid (HNO_3)
4. In the production of sodium carbonate
5. In the production of hydrogen

Test for ammonia

- ❖ Ammonia turns moistured litmus blue
- ❖ It gives white fumes with HCl gas owing to the formation of solid NH_4Cl

2. Nitric Acid (HNO_3)

❖ Nitric acid is also known as aqua fortis and spirit of nitre.

Uses

1. It is used to prepare “aqua regia” to dissolve the noble elements.
2. In the manufacture of explosives like dynamite, TNT, TNP, TNB

3. Nitrous Acid HNO_2

- ❖ Nitrous acid is a weak and monobasis acid.
- ❖ It has been prepared only in the form of cold, dilute solutions.

Uses

1. It is used as agricultural fertilizers where it promotes vigorous growth in plants.
2. It helps in the purification of silver, gold and platinum.

4. Nitric oxide NO (or) Nitrogen Oxide

❖ It is also known as nitrogen monoxide.

Preparation

❖ It is produced naturally during the electrical discharge of lighting in thunder storms



Uses

1. Nitric oxide (NO) is an important signalling molecule that acts in many tissues to regulate a diverse range of physiological and cellular processes.
2. It plays an important role in Neuro Transmission, immune defence, the regulation of cell death and cell motility.

5. Nitrous oxide (N₂O)

❖ “Laughing gas”

Source



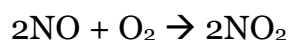
Uses

1. It is used in surgery for its anaesthetic and analgesic effects.
2. It is used as an oxidizer in rocketry and in motor racing to increase the power output of engines.

6. Nitrogen Dioxide (NO₂)

- ❖ Nitrogen dioxide is a reddish brown toxic gas.
- ❖ It is a prominent air pollutant.

Preparation



Uses

1. Nitrogen dioxide, has been used as a catalyst in certain oxidation reactions

2. It is used as a rocket fuel.

Isotopes of nitrogen

Stable	Radioactive
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${}^7\text{N}^{14}$

${}^7\text{N}^{13}$

${}^7\text{N}^{15}$

${}^7\text{N}^{16}$

1. Half life period is N¹³ is 10 minutes
2. N¹⁶ used in nuclear reactor instead of heavy water
3. Plants obtained food from N¹⁵
4. North-South polar region occurs sky light such as aurora borealis, Aurora australis due to N¹⁴.

Uses of nitrogen compounds

1. Liquid ammonia is used as a solvent
2. Ammonia is used as a refrigerant in ice plants.
3. Artificial silk, urea, fertilizers washing soda are prepared by ammonia.
4. Nitrous acid is used in the manufacture of azo-dyes.
5. Nitrous oxide is used as a anaesthetic.
6. Nitric acid is used in the manufacture of fertilizers explosives liked TNT, GTN etc.

NITROGEN AND ITS COMPOUNDS

7. Nitric acid is used in the purification of gold and silver.
8. Nitric acid is used in pickling of stainless steel.
9. Liquid nitrogen is used as a refrigerant.

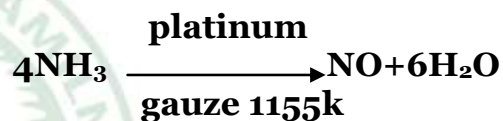
Nitric Acid

- ❖ Nitric acid is an important oxyacid of nitrogen. It was called as “aqua fortis” by alchemists. It means strong water. It was first prepared by Glauber (1650)

Preparation of nitric acid (ostwald's process)

- ❖ Toluene react with nitrating mixture (con HNO_3 , con H_2SO_4) react to form TNT
- ❖ GTN (Nitro glycerine (or) glycerol trinitrate)
- ❖ Glycerol reacts with con HNO_3 , con H_2SO_4 to get GTN.

- ❖ Large quantities of ammonia manufactured by Haber's process are converted into nitric acid by ostwald's process.



(Nitrogen Dioxide)

