Agriculture and Industry

Calculate oxidation states and recall and write full and half equations for the redox reactions involved in the interconversion between compounds in the nitrogen cycle

Compound	Systematic name	Oxidation state of Nitrogen
N ₂	Nitrogen gas	0
NO ₃ -	Nitrate (V) ion	+5
NO ₂ -	Nitrate (III) ion	+3
NH_4^+	Ammonium ion	-3
NH₃	Ammonia	-3
N₂O (colourless)	Dinitrogen (I) oxide	+1
NO (colourless)	Nitrogen (II) oxide	+2
NO ₂ (brown)	Nitrogen (IV) dioxide	+4
N ₂ O ₄ (colourless)	Dinitrogen tetroxide	+4

To produce balanced equation for the inter-conversion of these compounds, first the number of atoms is balanced, then the charges using the addition of H^+ $C^- O^- H_2$ example: N₂-N+ O^+ $C^- O^- H_2$ First balance the number of nitrogen atoms:

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Then the number of hydrogen atoms:

$$N_2 + 8H^{\scriptscriptstyle +} \rightarrow 2NH_4^{\scriptscriptstyle +}$$

There is an uneven balance of charge on both sides (8+ on the left , 2+ on the right), this is altered with the addition of electrons:

$$\mathrm{N_2}+8\mathrm{H^+}+6\mathrm{e^-}\rightarrow 2\mathrm{NH_4^+}$$

Recall the structure and bonding in nitrogen gas, ammonia and the ammonium ion and the appearance and names of the oxides of nitrogen: NO2, NO, N2O

Nitrogen gas

- Two nitrogen atoms with a triple covalent bond
- Linear structure
- 180° bond angle

