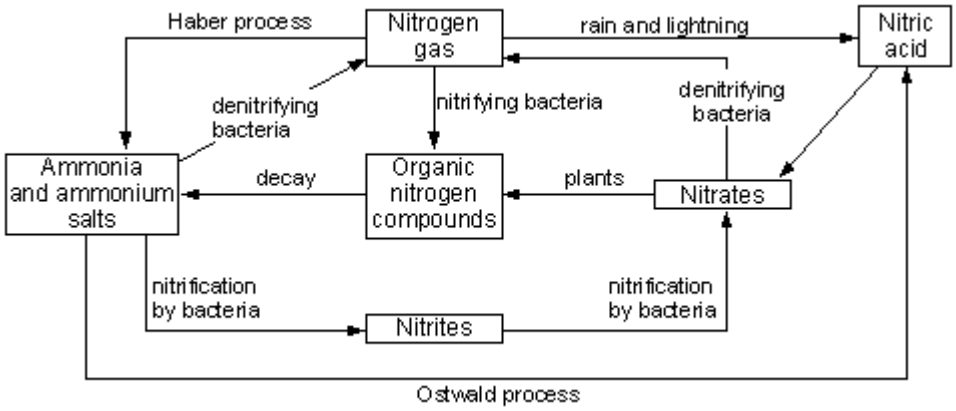
Practice exam questions for Chapter 1: Oxidation and Reduction (Paper saver version)

Question 1 (Bursary 2002 Question 8)

Ammonia features prominently in the nitrogen cycle occurring in the biosphere. When ammonia is released back into the soil, it is changed into nitrates by soil bacteria.

The nitrogen cycle

A diagram showing the main processes involved in the nitrogen cycle is given below.



a Give the oxidation state of nitrogen in each of the following species. A

i NH_4^+

ii NO_2^-

iii NO_3^-

iv N_2

b For each of the following changes, state whether the nitrogen is **oxidised**, **reduced** or **neither**. M

i the action of denitrifying bacteria on nitrates.

ii the formation of nitrate ions from nitric acid.

iii the Ostwald process.

Question 2 (Bursary 2000 Question 6)

a Bromide ions react with chlorine to give elemental bromine as shown below.

$Cl_2(aq) + 2Br^-(aq) \rightarrow Br_2(aq) + 2Cl^-(aq)$

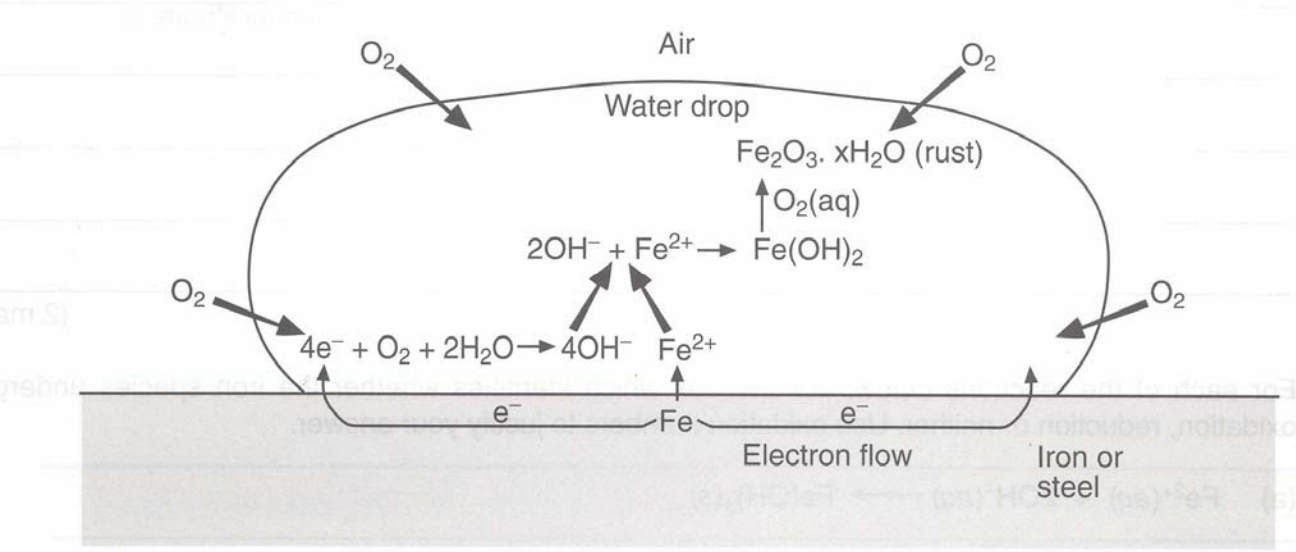
Name another halogen that can be produced from its halide ion by reaction with chlorine. A

b Select the species below that is the strongest reducing agent. A

I_2 I^- Cl^- F_2 F^-

Question 3 (Bursary 1999 Question 6)

Iron rusts when it is in contact with moist air. The diagram represents the process of rusting in a drop of water. In the water drop, different areas act as sites of oxidation and reduction.



a Write balanced half-equations for:

i oxidation of Fe to Fe^{2+}

ii reduction of O_2 to OH^-

b Combine the two half-equations in **a** to give the overall equation for the reaction of Fe with O_2. A M

c For each of the reactions below, state whether the iron species undergoes oxidation, reduction or neither. Justify your answers. A M

i $Fe^{2+}(aq) + 2OH^- \rightarrow Fe(OH)_2(s)$

ii $Fe(OH)_2(s) \xrightarrow{O_2} Fe_2O_3.xH_2O(s)$ (equation not balanced)

d What colour change is observed when $Fe(OH_2)$ changes to $Fe_2O_3.xH_2O$?

Question 4 (Bursary 2000 Question 2)

a What is the oxidation state of vanadium in the VO_2^+ ion? A

Vanadium pentoxide reacts with chlorine as shown below.

$$2V_2O_5 + 6Cl_2 \rightarrow 4VOCl_3 + 3O_2$$

b Which reactant is the reductant? A
Justify your answer. M