Haber process

→ $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

$\Delta H = -92J$

- Industrial preparation of ammonia.
- Hydrogen and nitrogen is purified, dried and mixed. Mixture is supressed by compression pumps in chromium steal reaction tubes where they react in the presence of an iron catalyst to form ammonia.
- Highest % yield at a low temperature and high pressure.
- At a low temperature the speed of the forward reaction is too slow and will take too long to reach equilibrium.
- High pressure increases NH_3 yielding, but reaction tubes and compressors that can resist high pressure are expensive, which is why lower pressure is more economic.

- **Speed up the process by:**
  Raising pressure
  Using a moderate temperature
  Using a catalyst
  Enlarging the surface of the catalyst (state of division)
  Removing NH_3 as it is being made

Contact process

→ $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

$\Delta H = -98J$

- Industrial preparation of Sulphuric acid.
- Sulphur burns in dry air and form sulphur dioxide which is then purified, then cooled down, sulphur dioxide reacts with oxygen and forms sulphur trioxide in the presence of catalyst – vanadium pentoxide (V_2O_5). $H_2S_2O_7$ = spiro sulphuric acid, smoking sulphuric acid, oleum.
- Highest % yield at a low temperature and high pressure.
- At a low temperature the speed of the forward reaction is too slow and will take too long to reach equilibrium.
- High pressure will produce a high SO_3 yield, but it needs a strong apparatus to be able to resist it.
- Industrially prepared at a pressure of 1 atmosphere. 101,3KPa.

- **Speed up the process by :**
  Using a moderate temperature
  Using a catalyst
  Enlarging the surface of the catalyst
  Raising pressure