Chapter 10 Ammonia notes

Tuesday, 25 June 2024 12:39 PM

10.1 How can ammonia be made?
10.2 What are some reversible reactions?

Uses of ammonia:
- Used to make fertilisers
- Used to make explosives, pesticides and other chemicals

How is ammonia made?
- Using Haber process
- Raw materials = Nitrogen + Hydrogen
- Nitrogen gas ⇒ Fractional distillation of liquid air
- Hydrogen gas ⇒ Cracking/Breaking down of crude oil fractions

Definition of reversible reactions:
- A reversible reaction is a reaction that can go both forward and backward at the same time

⇌ } symbol

*At room temperature, nitrogen gas is unreactive
Iron is added as a catalyst to speed up the reaction.
↳ remains chemically unchanged at the end of reaction

Effect of pressure on ammonia
- Higher pressure = Higher yield of ammonia and faster reaction

Why can't a high pressure be used?
- A high pressure requires expensive equipment and a large amount of electricity. This incurs a large cost.

∴ A compromise of 200atm is used.

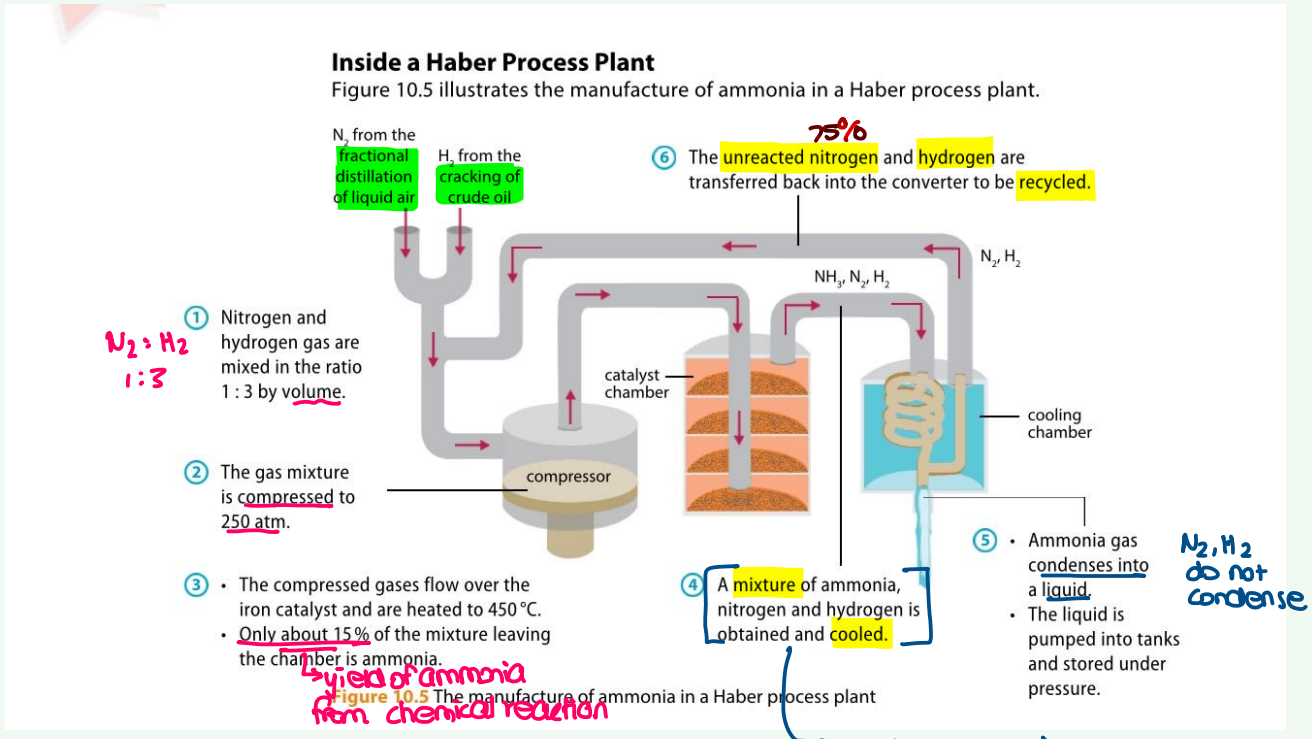
Effect of temperature on ammonia:
- Lower temperature = Higher yield of ammonia. Faster rate of reaction

Why can't a low temperature be used?
- A lower temperature results in a slower rate of reaction

∴ A compromise of 450°C is used.

Purpose of catalyst:
↳ The reaction is slow despite having a relatively high temperature and high pressure. Hence, an iron catalyst is used to speed up the reaction

Optimal/best conditions to produce maximum yield of ammonia at minimal cost:
- A pressure of 250atm
- A temperature of 450°C
- the presence of finely-divided iron catalyst



Reversible reaction:
Both forward and backward reactions take place simultaneously