|  |  |
| --- | --- |
| **Factory owner** | **Scientist –**  **why is the factory owner wrong?!** |
| “Let’s get this ammonia made quickly. I want the highest temperature we can get so that the rate of reaction is fast! There is no time to waste!” |  |
| “Let’s use an iron catalyst because I want to increase the yield of ammonia.” |  |
| “Using a pressure of 200 atmospheres is going to bankrupt me. These gases don’t compress themselves you know and I am going to need extremely strong and expensive pipes to withstand the pressure. Let’s use a pressure of 100 atmospheres.” |  |
| “Let’s get hydrogen from H2O as water is free and so this will cost me nothing!” |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | Haber Process and compromise conditions | **Level** | GCSE (or any other course for students aged 11-16) |
| **Outcomes** | To understand the effects of temperature, catalysts and pressure on the rate, yield and economics of ammonia production | | |
| **Information for teachers** | This activity gets students to think deeply about compromise conditions. They need to think about the balance between rate, yield and cost. | | |

**The Haber Process: when life’s just one big compromise!**

3H2 + N2 ⇌ 2NH3 ΔH-92 kj/mol

