Oxford Cambridge and RSA

GCSE Chemistry B (Twenty First Century Science)

J258/03 Breadth in chemistry (Higher Tier)

Question Set 22

1 Ammonia and its compounds are used world-wide as fertilisers.

Ammonia is made by the Haber process.

This is an equation for the reaction:

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

The forward reaction is exothermic.

(a) The $\rightleftharpoons$ sign shows that the reaction is 'in equilibrium'.

Which two statements are correct for this reaction at equilibrium?

Tick (✓) **two** boxes.

The reaction $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$ has stopped. ☐

There is a mixture of N_2, H_2 and NH_3. ☐

The reaction $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$ is going in both directions. ☐

The reaction $2NH_3(g) \longrightarrow N_2(g) + 3H_2(g)$ does not happen. ☐

[2]

(b) Which two statements about the Haber Process are correct?

Tick (✓) **two** boxes.

Nitrogen is the most expensive raw material. ☐

Hydrogen is made from natural gas and steam. ☐

Ammonia is separated and the nitrogen and hydrogen are recycled. ☐

The reaction is faster at low pressures. ☐

[2]

(c) In the Haber process a temperature of 450 °C is often used.
Nina says,

'The Haber process should be run at a lower temperature. More ammonia is produced per day at a lower temperature.'

Discuss Nina's statement. **[3]**

(d) Jamal, another student, says,

‘Fertilisers that contain ammonium compounds should be banned.’

Give **one** argument for and **one** argument against these types of fertilisers being banned.

[2]

Total Marks for Question Set 22: 9