Ammonia, NH_3, is an industrially-important chemical. It is produced on an industrial scale by the Haber process. The reaction for the Haber process is shown below.

$$N_2(g) + 3\,H_2(g) \rightleftharpoons 2\,NH_3(g) + 92\ kJ\ mol^{-1}$$

23. The Contact process, which is used to produce sulfuric acid, is another industrially-important process. The process contains several steps, one of which is the production of sulfur trioxide, SO_3, as shown below.

$$2\ SO_2(g) + O_2(g) \rightleftharpoons 2\ SO_3(g) \qquad \Delta H = -196\ kJ\ mol^{-1}$$

Which statement regarding both the Haber and Contact processes is correct?

(a) Both are exothermic and both need a suitable catalyst to occur at a satisfactory rate.
(b) Both are endothermic and both need a suitable catalyst to occur at a satisfactory rate.
(c) Both need a suitable catalyst so that the yield of their respective products is maximised.
(d) Both can achieve high rates and high yields without the need for a catalyst.