

## Question B

In the neutralization of the acid gas at a waste-to-energy plant's flue gas treatment system, there are trade-offs between the two reagents that could be used: hydrated lime ( $\text{Ca}(\text{OH})_2$ ) and sodium bicarbonate ( $\text{NaHCO}_3$ ). In fact, heated treatment systems may choose hydrated lime due to its low cost; however, its reactivity is low such that a high stoichiometric ratio ( $>2.0$ ) will be needed compared to sodium bicarbonate ( $>1.2$ ), which has high reactivity at high temperatures (140-200 degrees C) that makes its stoichiometric ratio low, thus its treatment efficiency can effectively produce high quantities of solid residues that can be disposed of as APCR compared to sodium bicarbonate that can remove high quantities of  $\text{SO}_2$  effectively. In addition to that, its sodium residues are highly soluble; hence, its salts can be recycled via the Solvay process for detoxification. In the end, its reagent cost is high compared to sodium bicarbonate; however, its advantages over bicarbonate are low residue quantities that are highly soluble, which can then be recycled for salt recycling processes such as the Solvay process for detoxification.