

Question 21 (7 marks)

Evaluate the impact of industrial sources of sulfur dioxide and nitrogen oxides on the environment, making use of appropriate chemical equations.

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SO_2 is released industrially by the smelting of metal sulfides: $\text{ZnS} + \text{O}_2 \rightarrow \text{ZnO} + \text{SO}_2$, and the burning of fossil fuels. NO_x is released by the combustion of $\text{O}_2 + \text{N}_2$ in high temperature environments: $\text{O}_2 + \text{N}_2 \xrightarrow{\text{heat}} 2\text{NO}_2$, and from the manufacturing of nitric acid. Both SO_2 + NO_2 have large effects on the natural environment. SO_2 reacts with H_2O to form acid rain:

$\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$ - sulphurous acid. ~~It is also~~

~~formed~~ Sulfuric acid can also be formed: $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$. Acid rain has severe effects on the environment, such as penetrating into soils and dissolving necessary nutrients needed for plant growth. It also runs into lakes and rivers, decreasing the pH of the water and so destroying many organisms. & Acid rain can also destroy statues + marble, by dissolving:

& $\text{H}^+ + \text{CaCO}_3 \rightarrow \text{HCO}_3^- + \text{Ca}^{2+}$, the calcium carbonate.

NO_x also causes many harmful effects on the environment. Carbon monoxide is commonly produced from cars, which goes into the atmosphere and ~~causes~~ contributes to photochemical smog. It is causes respiratory problems in organisms.