Enthalpy of combustion

Compare the enthalpy of combustion of H_2, N_2 and Cl_2. You will need the following data.

$$\Delta_f H^o(NO_2) = +33.6\ kJ/mol$$

$$\Delta_f H^o(ClO_2) = +104.8\ kJ/mol$$

$$\Delta_f H^o(H_2O) = -286\ kJ/mol$$

Of the diatomic molecules given here explain why is H_2 a good fuel.

Enthalpy of combustion

Step 1: We need to write balanced equations for each combustion process.

$$\frac{1}{2}N_2 + O_2 \rightarrow NO_2$$

$$\frac{1}{2}Cl_2 + O_2 \rightarrow ClO_2$$

$$H_2 + \frac{1}{2}O_2 \rightarrow H_2O$$

Enthalpy of combustion

Step 2: Determine the enthalpies of combustion.

In this case the reactions that we have written are both the enthalpies of formation and combustion. They happen to be one and the same. Therefore, we can write:

$$\Delta_{comb}H^{o}(NO_2) = +33.6\ kJ/mol$$
$$\Delta_{comb}H^{o}(ClO_2) = +104.8\ kJ/mol$$
$$\Delta_{comb}H^{o}(H_2O) = -286\ kJ/mol$$

We see that only H_2 is exothermic. The other species are endothermic and cannot be fuels.