



Chemistry ★



Sometimes it is impossible or impractical to measure the enthalpy change (ΔH) of a reaction by using a calorimeter, because :

- Some reactions occurs so slowly that measuring the enthalpy change is impossible.
- Other reactions occur under conditions difficult to duplicate in a laboratory.
- Still others produce products other than the desired ones.

Hess's law of heat summation : States that if you can add two or more thermochemical equations to produce a final equation for a reaction, then the sum of the enthalpy changes for the individual reactions is the enthalpy change for the final reaction.

Rules for Hess's Law Calculations :

- Add the corresponding ΔH_{rxn} values when you add the two chemical equations together.
- If we reverse the direction of a chemical reaction, then the sign of ΔH_{rxn} should be reversed.
- If you multiply a chemical reaction by a factor, then you need to multiply ΔH_{rxn} by the same factor.

Add the corresponding ΔH_{rxn} values when you add the two chemical equations together.



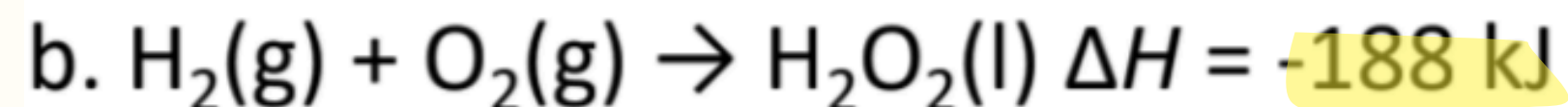
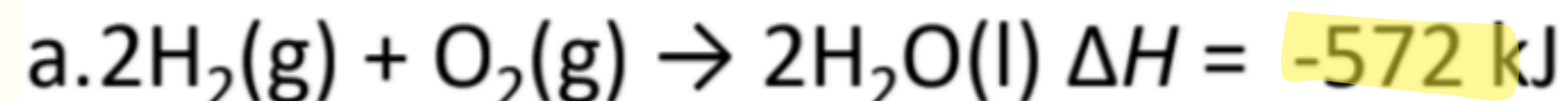
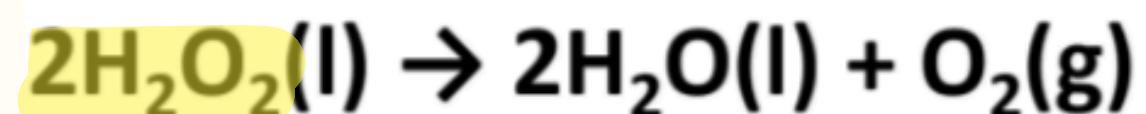
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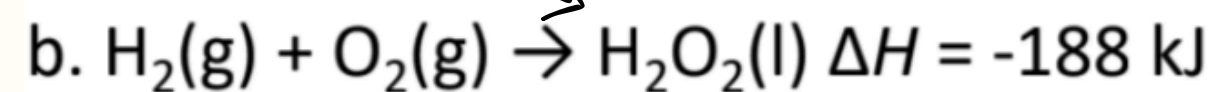
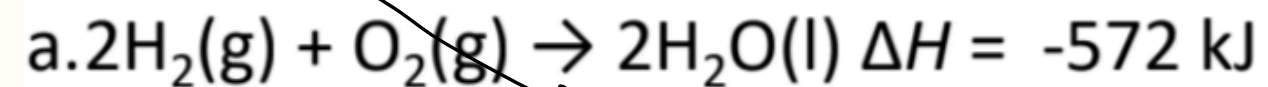


If you multiply a chemical reaction by a factor, then you need to multiply ΔH_{rxn} by the same factor.

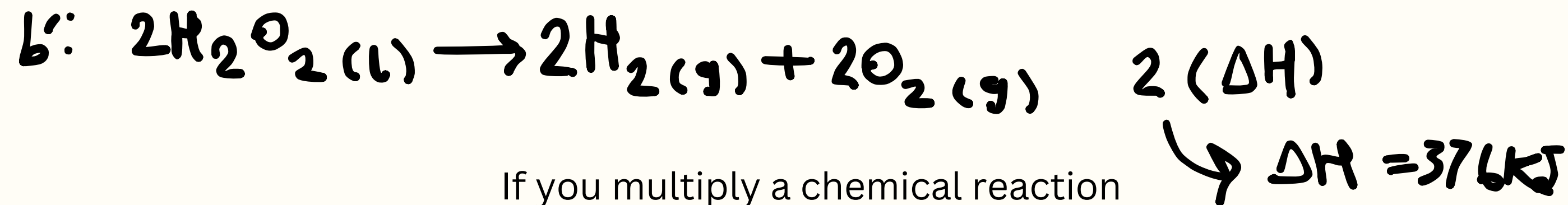
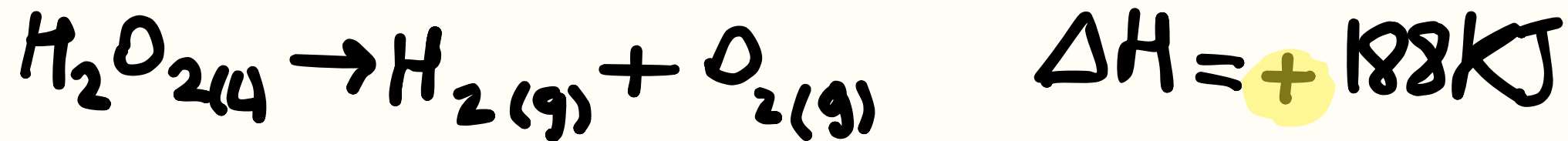


Use thermochemical Equations **a** and **b** below to determine ΔH for the decomposition of hydrogen peroxide (H_2O_2), a compound that has many uses ranging from bleaching hair to powering rocket engines.



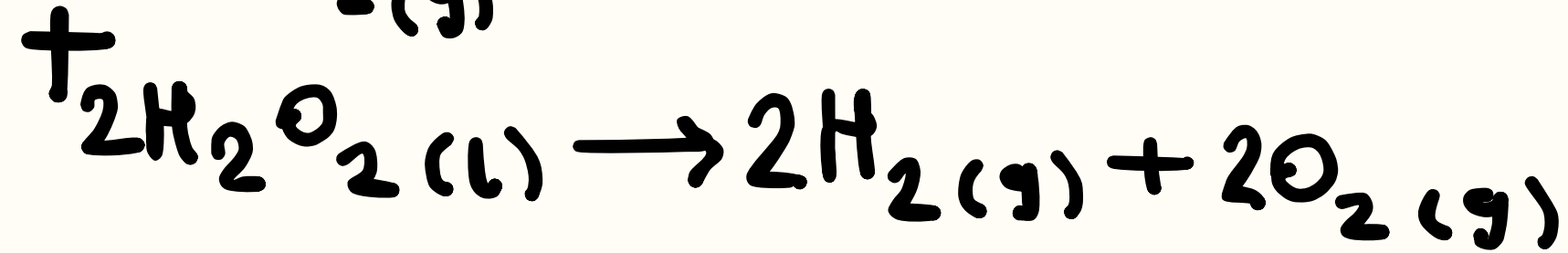
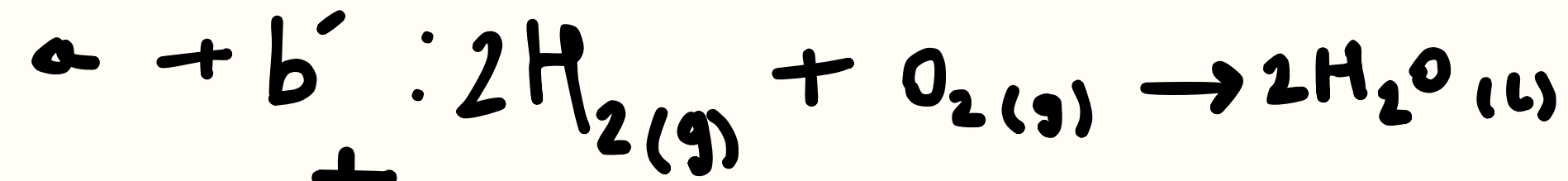


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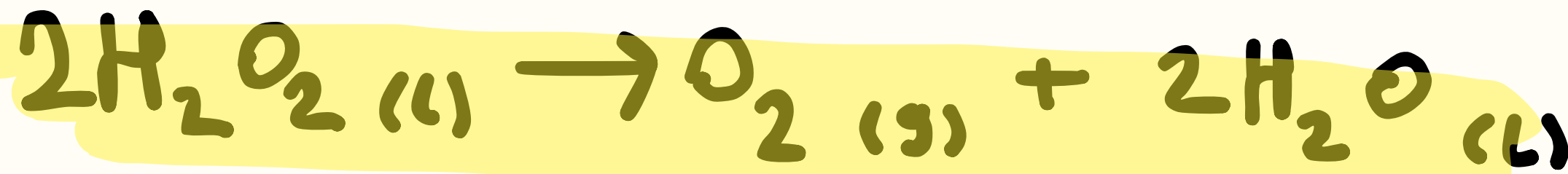
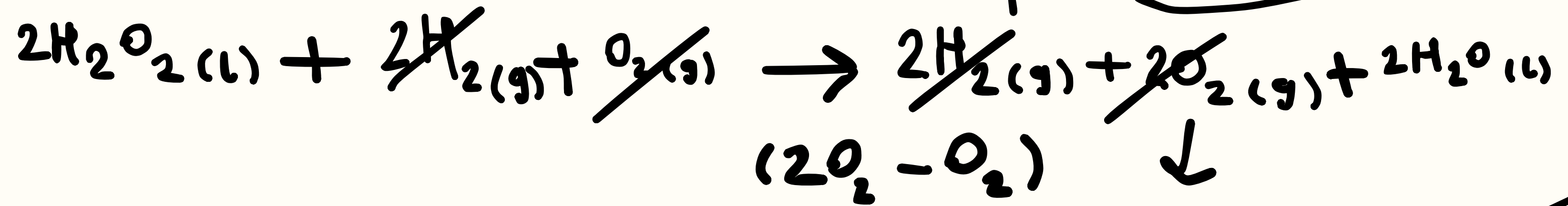
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Add the corresponding ΔH_{rxn} values when you add the two chemical equations together.



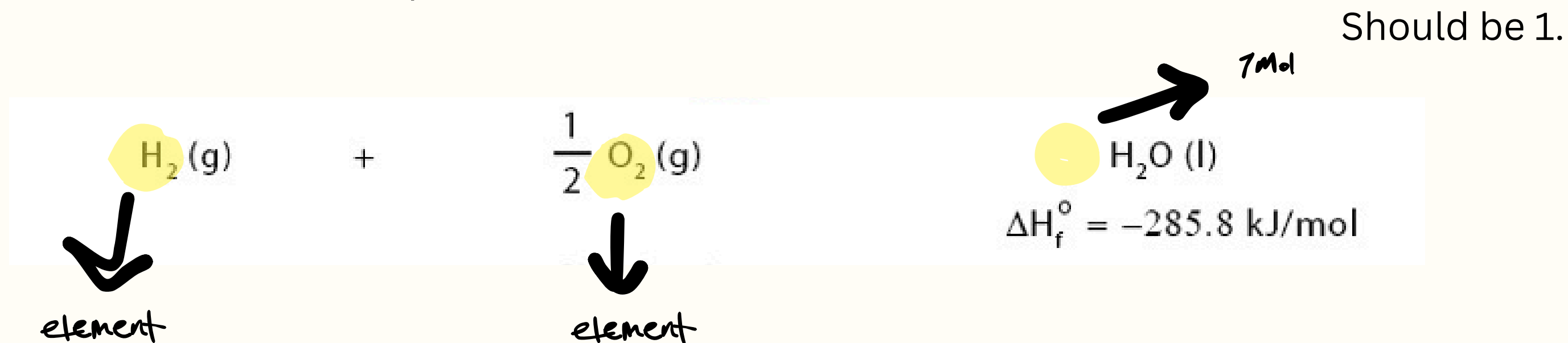
$$\Delta H = -572 \text{ KJ}$$

$$+ \Delta H = 376 \text{ KJ}$$



$$\Delta H = -196 \text{ KJ}$$

The standard enthalpy (heat) of formation (ΔH_f°) : is the change in enthalpy when one mole of a substance in the standard state (1 atm of pressure and 298.15 K) is formed from its pure elements under the same conditions.



Can not be a compound.

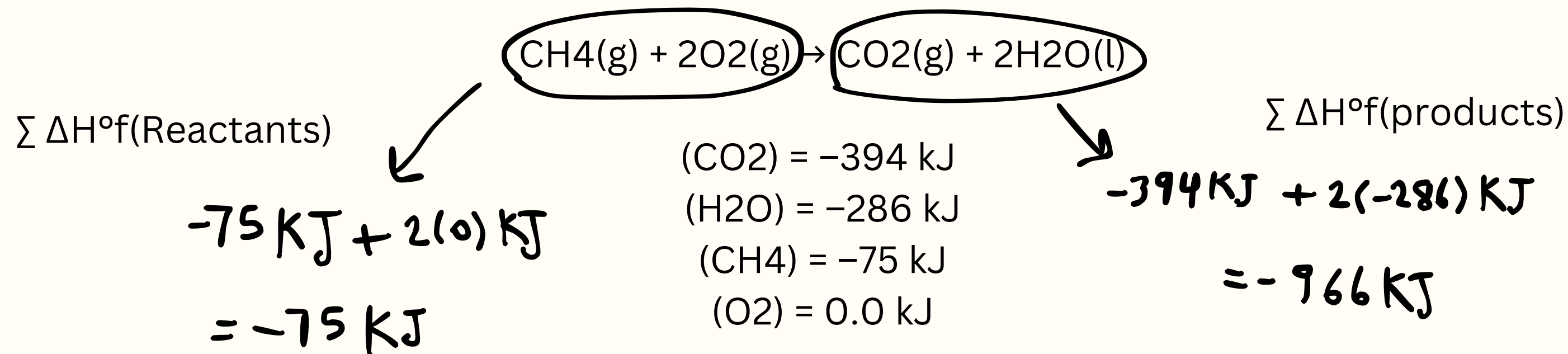
The standard state of a substance : it is the normal physical state of the substance at 1 atm and 298 K.

The standard state of carbon is graphite.

The standard enthalpy of formation of any element in its standard state is zero by definition (It is always 0.0 kJ).

The Summation Equation :
$$\Delta H^\circ \text{ reaction} = \sum \Delta H^\circ \text{f}(\text{products}) - \sum \Delta H^\circ \text{f}(\text{Reactants})$$

Use standard enthalpies of formation to calculate $\Delta H_{\text{rxn}}^\circ$ for the combustion of methane.



$$\Delta H_{\text{rxn}}^\circ = ? \text{ kJ}$$

$$\Delta H^\circ_{\text{reaction}} = \Sigma \Delta H^\circ_f(\text{products}) - \Sigma \Delta H^\circ_f(\text{Reactants})$$

$(-966 \text{ kJ}) - (-75 \text{ kJ})$
 $\rightarrow = -891 \text{ kJ}$

Sulfur (S) reacts with oxygen (O_2) to form sulfur dioxide (SO_2).

Sulfur dioxide (SO_2) can further react with oxygen to form sulfur trioxide (SO_3).

Sulfur dioxide (SO_2) reacts with water to form sulfurous acid (H_2SO_3) (Sulfurous acid is a weak acid).

Sulfur trioxide (SO_3) reacts with water to form sulfuric acid (H_2SO_4) (Sulfuric acid is a strong acid).

Which reaches earth as acid precipitation.

Acid precipitation slowly destroys trees and property.

Thus all sulfur oxides are harmful and dangerous to the environment.



Have a nice day ★