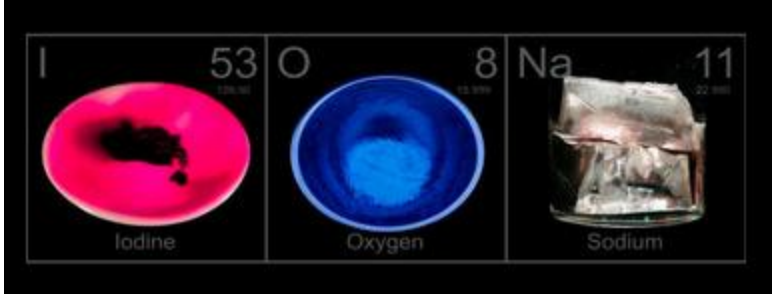
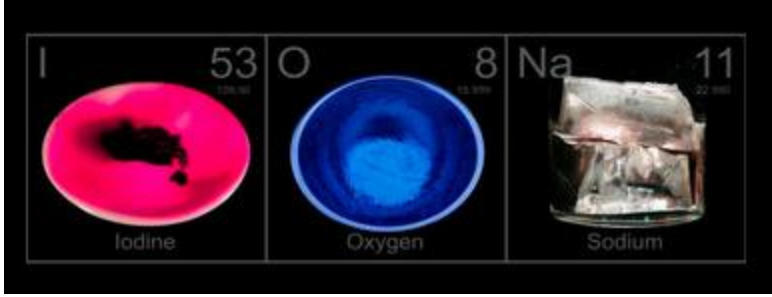


- Calorimetry is a very effective way of determining enthalpy changes

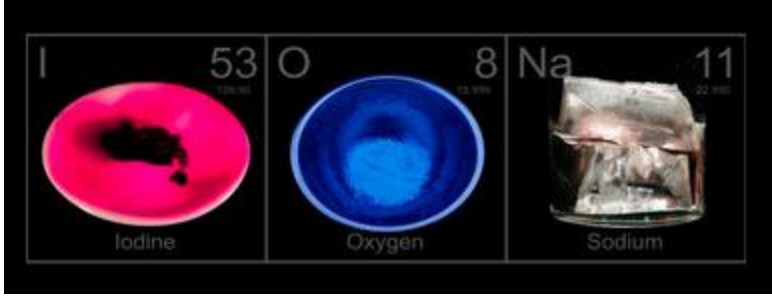
...but there are times when calorimetry cannot be used or is not practical.



- For example in reactions that are too slow

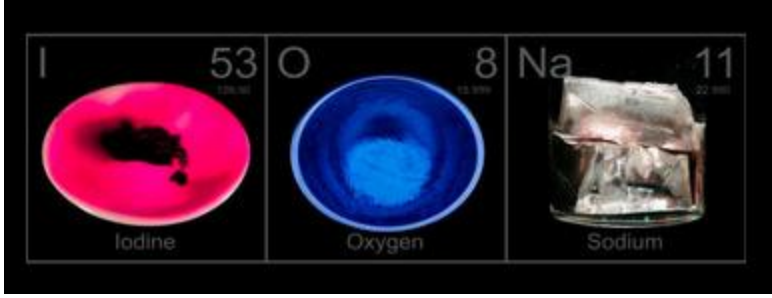
-resulting temp. change too small to detect.

i.e. rust



....or

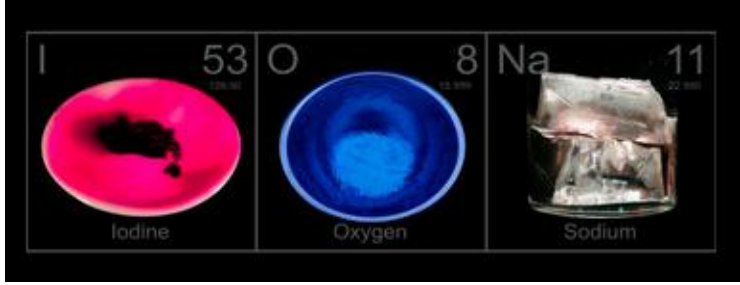
The combustion of carbon monoxide from its elements is impossible to measure with a calorimeter because the combustion of carbon produces carbon dioxide and carbon monoxide simultaneously.



- Luckily, a number of methods have been devised to get around the problem.

What a relief!!!!

Potential Energy Diagram

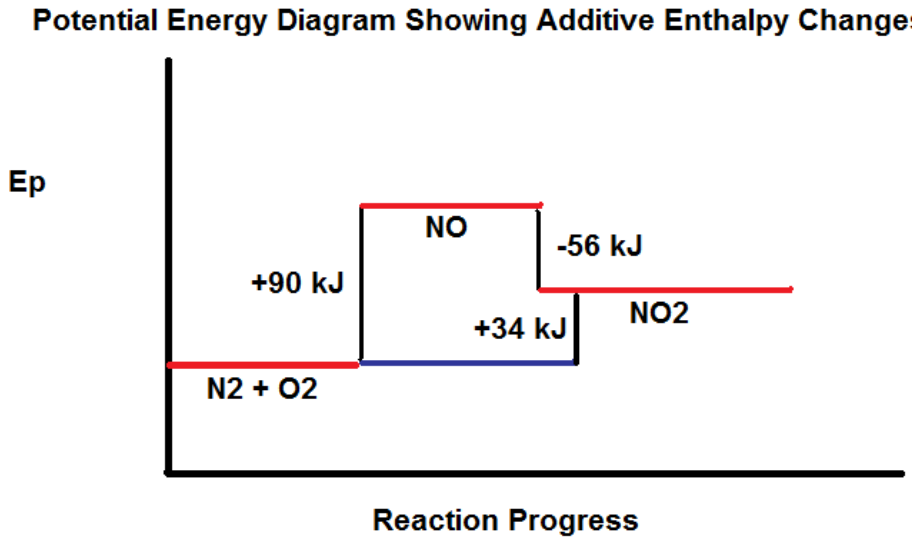


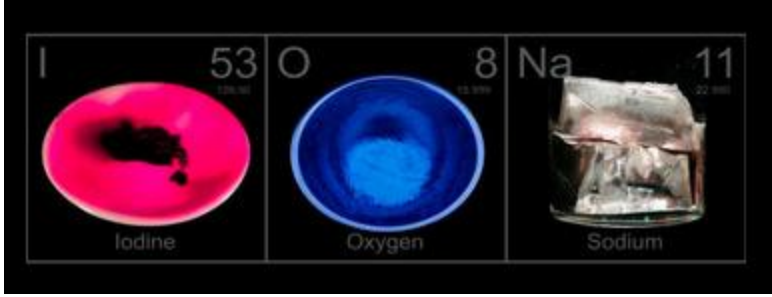
-nitrogen gas and oxygen gas combine to form nitrogen dioxide.

-there are two different paths to reach the product

i. N2 and Ox react to form NO (+90KJ), then NO and more O react to form NO2 (-56kJ).

ii. N2 and O2 react directly to form NO2 gas. As in path i, delta H is +34 kJ

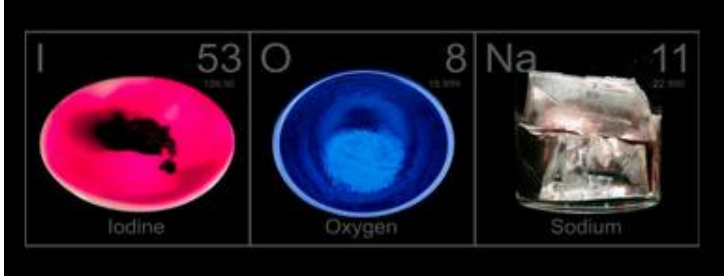




Hess's Law: The value of ΔH for any reaction that can be written in steps equals the sum of the values of ΔH for the individual steps.

Or: if two or more equations with known enthalpy changes can be added together to form a new "target" equation, then their enthalpy changes may be similarly added together to yield the enthalpy change of the target equation.

Hess's Law and Enthalpies of Formation

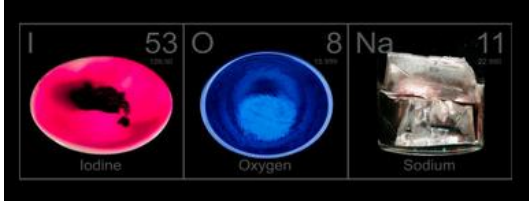


- There are a special set of reactions called formation reactions in which compounds are formed from their elements.

$-\Delta H_f$

-always written as for one mole of a particular product

Hess's Law and Enthalpies of Formation



-called standard enthalpy of formation because it takes place in standard conditions, with reactant elements in their standard states.

-The ΔH_f for elements is zero