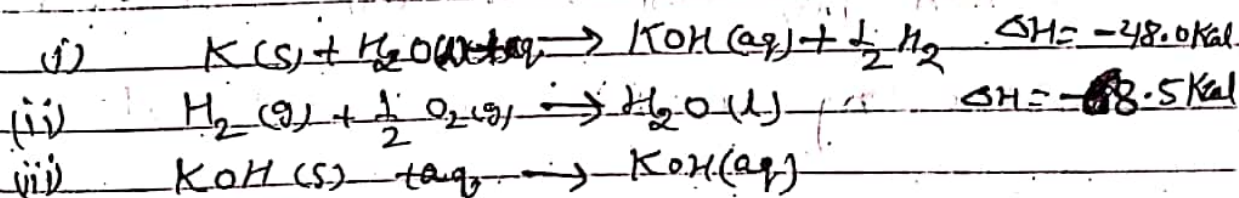


Topic: → Applications of Hess's Law

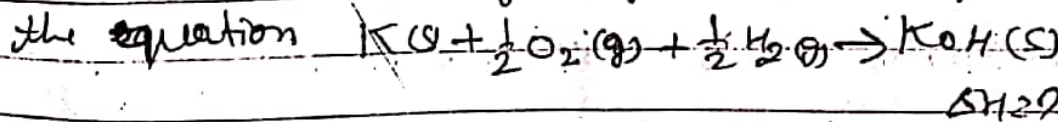
(1) Determination of heat of formation of substances which otherwise cannot be measured experimentally: -

The substances like methane, carbon monoxide, benzene etc. cannot be prepared by uniting their elements. Therefore it is not possible to measure the heats of formation of such compounds directly. These can be determined by using Hess's Law.

eg. Calculation of heat of formation of potassium hydroxide (KOH) from the following data:

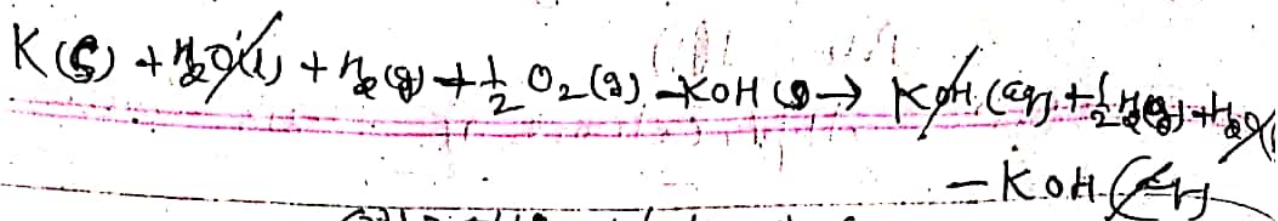


We should aim at finding the value of ΔH for the equation

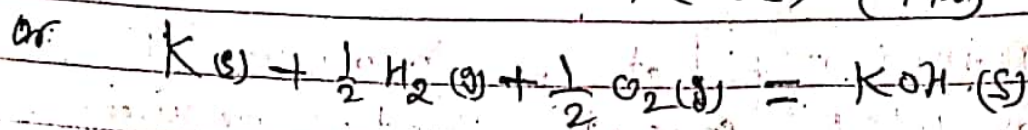


which is the heat of formation.

We get this equation by adding equations (i) & (ii) and by subtracting equation (iii) which gives



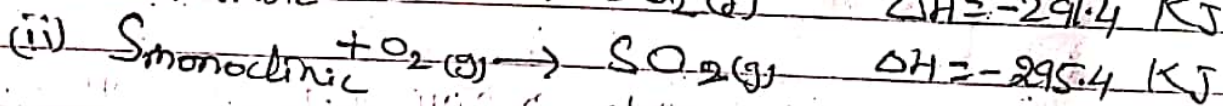
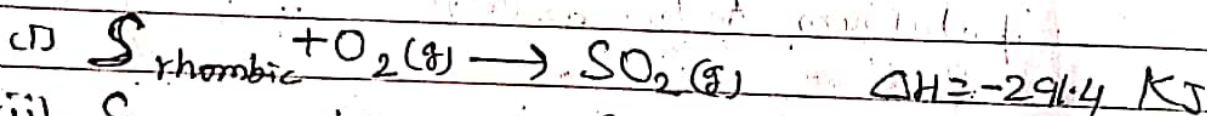
$$\Delta H = -480 + (-68.5) - (-14.0)$$



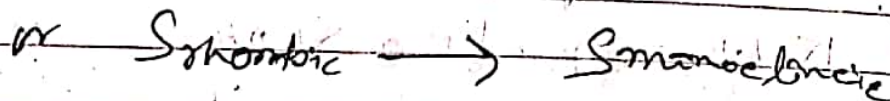
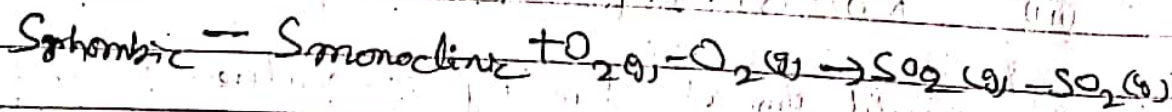
$$\Delta H = -102.5 \text{ Kcal.}$$

Thus, the heat of formation of KOH is -102.5 Kcal.

(2) Determination of heat of transition \rightarrow the heat of transition of one allotropic form to another can also be calculated with the help of Hess's Law. e.g., the enthalpy of transition from monoclinic sulphur to rhombic sulphur can be calculated from their heats of combustion which are



Subtracting eqn (ii) from (i) we get

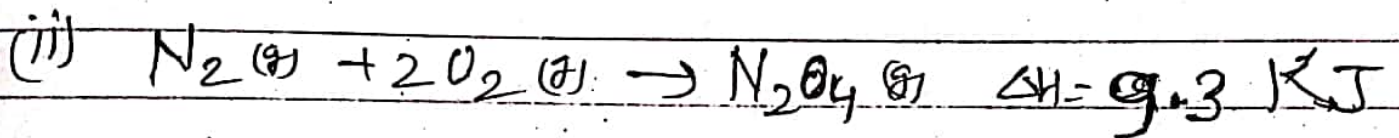
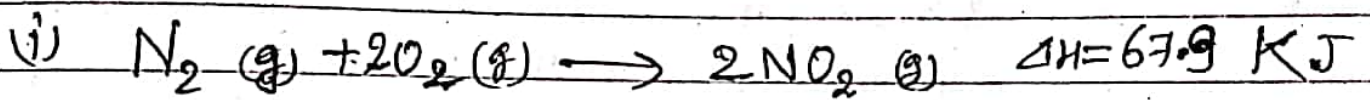


$$\Delta H = -296.4 - (-295.4) = 4 \text{ KJ}$$

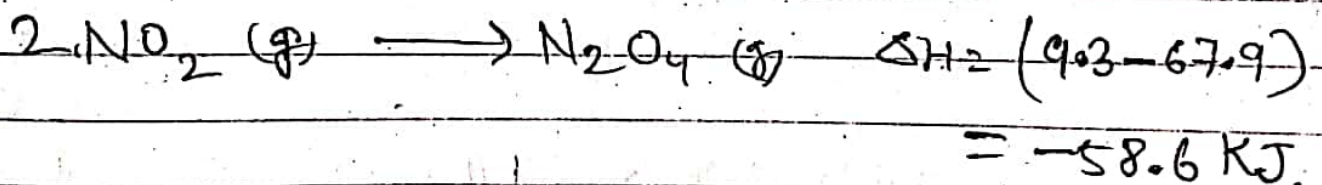
Thus, the heat of transition of rhombic sulphur to monoclinic sulphur is 4 KJ.

(3) Determination of heats of various reactions
By using Hess's Law we can calculate the heats or enthalpies of many reactions which otherwise cannot be measured directly.

eg. From the following equations the enthalpy of dimerisation of NO_2 can be calculated.



Subtracting eqn (i) from eqn (ii) we have



Thus the heat of dimerisation of NO_2 is -58.6 KJ .