Answer on Question #41036 - Chemistry - Other

Question:

$X_2 + 3Y_2 \rightarrow 2XY_3$ ΔH1= -320 kJ
$X_2 + 2Z_2 \rightarrow 2XZ_2$ ΔH2= -170 kJ
$2Y_2 + Z_2 \rightarrow 2Y_2Z$ ΔH3= -250 kJ
Calculate the change in enthalpy for the following reaction:
$4XY_3 + 7Z_2 \rightarrow 6Y_2Z + 4XZ_2$
ΔH =____?___ kJ

Solution.

$X_2 + 3Y_2 \rightarrow 2XY_3$ (1)

$X_2 + 2Z_2 \rightarrow 2XZ_2$ (2)

$2Y_2 + Z_2 \rightarrow 2Y_2Z$ (3)

$4XY_3 + 7Z_2 \rightarrow 6Y_2Z + 4XZ_2$ (4)

It can easily be seen, that the fourth equation can be expressed through the sum of first three in such way:

(4) = - 2*(1) + 2*(2) + 3*(3)

According to Hess's law, the change in enthalpy for the reaction is:

$$\Delta H = 3 * \Delta H_3 + 2 * \Delta H_2 - 2 * \Delta H_1 = -250 * 3 - 170 * 2 + 320 * 2 = -450 \text{ kJ}$$

Answer: ΔH = -450 kJ