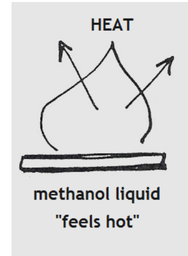
Aim: How do we use HEATS of REACTION (ΔH)? Table I



1) DEMO: burning methanol (*l*)

(a) Refer to Table **I**

$$2\ CH_3OH_{(l)} + 3\ O_{2(g)} \longrightarrow 2\ CO_{2(g)} + 4\ H_2O_{(l)}$$

ΔH = **-** 1452 kJ

minus sign, exothermic

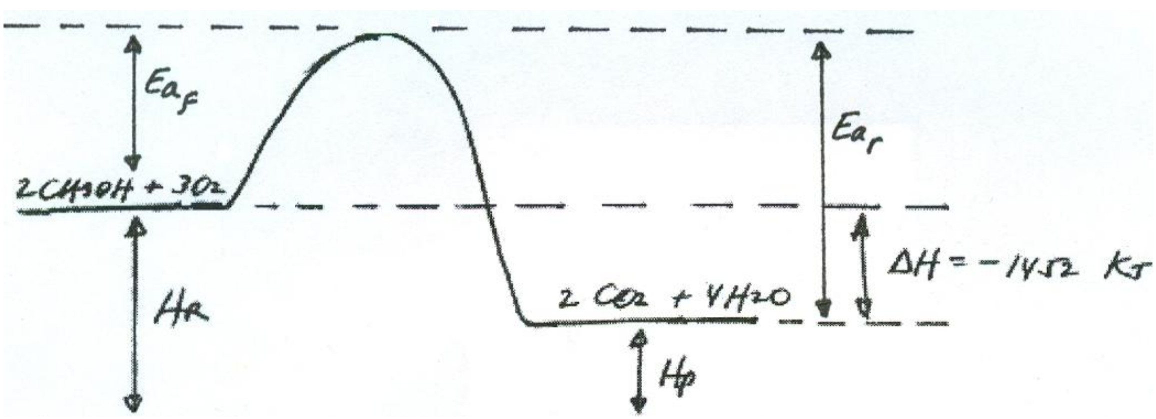
Note: 2 C_8H_{18}, ΔH = **-** 10,943 kJ ; {more **-**ΔH, more heat released}

(b) In an **exo**thermic reaction the heat **released** is placed on the **product** side.

$$2\ CH_3OH_{(l)} + 3\ O_{2(g)} \longrightarrow 2\ CO_{2(g)} + 4\ H_2O_{(l)} + 1452\ kJ$$

***Don't write the (-) in the equation!**

(c) P.E. diagram



(d) If the $Ea_{forward}$ = 50 kJ, what is the $Ea_{reverse}$?

Referring to the PE diagram, the $Ea_{reverse}$ is the energy needed for the products to go backwards in forming the reactants. Therefore, the $Ea_{reverse}$ would be the sum of the ΔH with its sign reversed, plus the $Ea_{forward}$.

Answer: 1452 + 50 = 1502 kJ

Or, if you prefer you can use the following formula, but don't forget to use a minus sign for exothermic reactions.

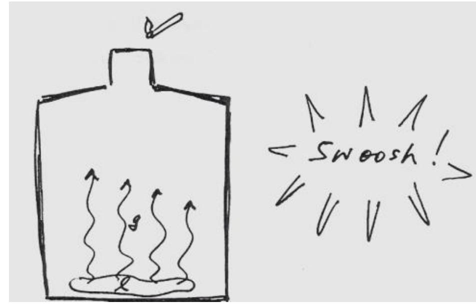
$$\Delta H = Ea_f - Ea_r$$

$- 1452 = 50 - x$

$- 1502 = - x \longrightarrow x = 1502$ kJ

DEMO: burning methanol vapor (*g*)

greater surface area
faster reaction rate



CAUTION Never try this at home!!

(e) How much heat is involved when 3 moles of CH_3OH undergo combustion?

Going back to the chemical equation, remember the coefficients represent molar quantities. So, just set up a ratio.

$$\frac{\mathbf{2}}{\mathbf{3}}\ CH_3OH = \frac{\mathbf{1452}}{\mathbf{x}}\ \text{kJ} \longrightarrow x = 2178\ \text{kJ released}$$

If time permits,

How many KJ are released by the complete combustion of 16 g CH_3OH?