



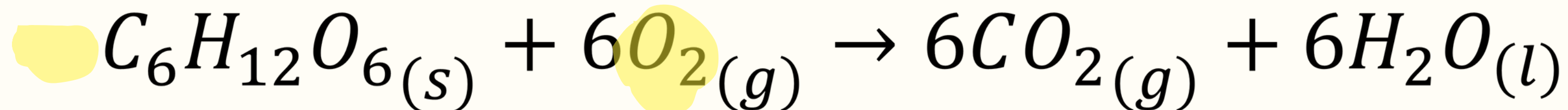
Chemistry ★



A thermochemical equation : is a balanced chemical equation that includes the physical states of all reactants and products and the energy change.

The energy change ---> the change in enthalpy (ΔH)

The enthalpy (heat) of combustion (ΔH_{comb}) of a substance : is the enthalpy change for the complete burning of one mole of the substance.



Should be 1
(1mol)

Should be a combustion reaction

$$\Delta H_{comb} = -2808KJ$$

-2808 KJ/mol

Standard enthalpy changes ---> (ΔH°)

The zero superscript indicates the changes were determined under standard conditions.

Standard state conditions : 298 K (25°C) , 1 atm pressure.

Molar enthalpy (heat) of fusion (ΔH_{fus}) : is the heat required to melt one mole of a solid.

Fusion : Solid $\rightarrow$ Liquid

Endothermic.

Molar enthalpy (heat) of vaporization (ΔH_{vap}) : is the heat required to vaporize one mole of a liquid.

Vaporization : Liquid $\rightarrow$ Gas

Endothermic.

Cond ---> condensation
Gas → Liquid
Exothermic.

Solid ---> freezing
Liquid → Solid
Exothermic.

$$\Delta H^{\circ}_{vap} = -\Delta H^{\circ}_{cond}$$

$$\Delta H^{\circ}_{fus} = -\Delta H^{\circ}_{solid}$$

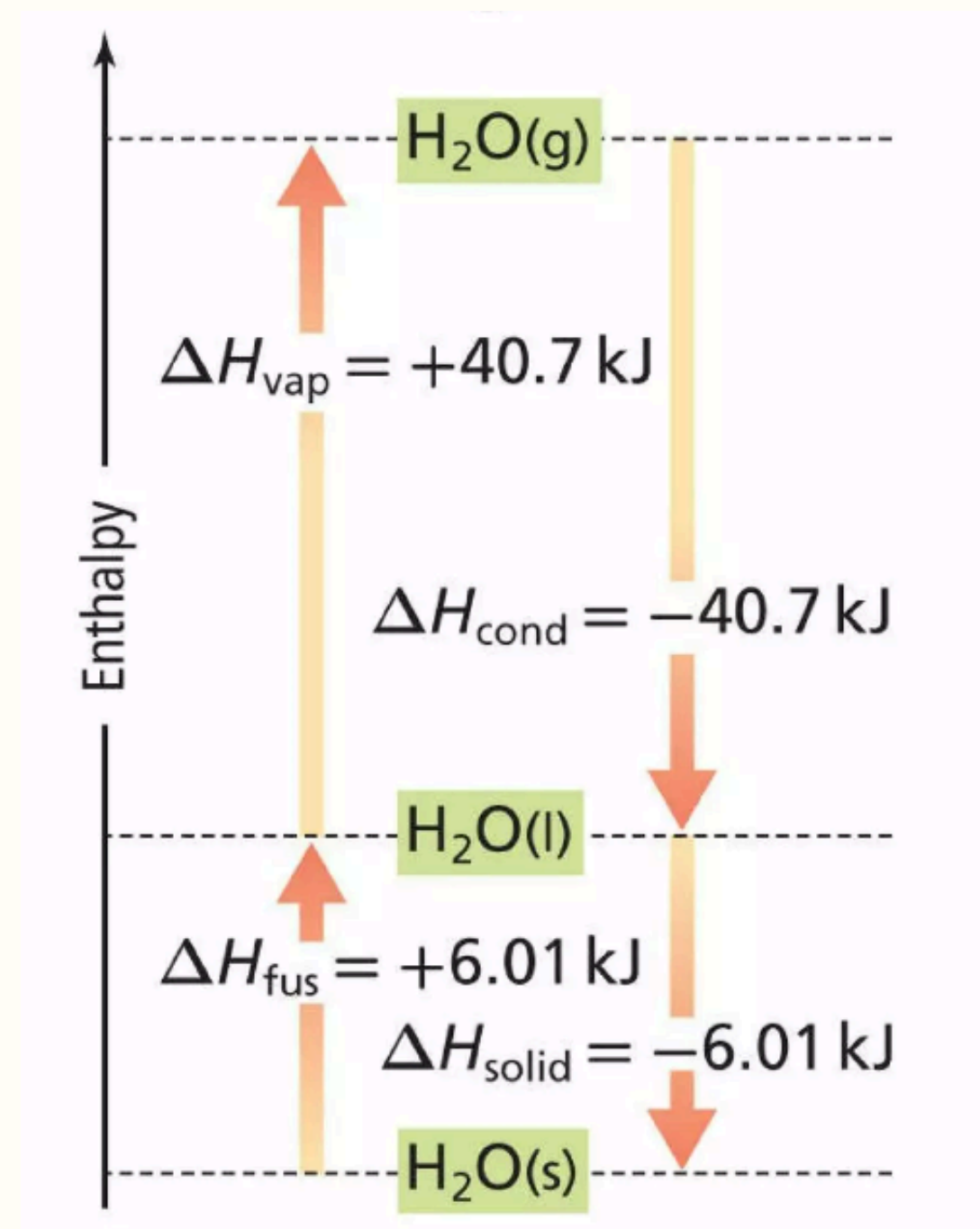
Table 15.4**Standard Enthalpies of Vaporization and Fusion**

Substance	Formula	$\Delta H_{\text{vap}}^{\circ}$ (kJ/mol)	$\Delta H_{\text{fus}}^{\circ}$ (kJ/mol)
Water	H ₂ O	40.7	6.01
Ethanol	C ₂ H ₅ OH	38.6	4.94
Methanol	CH ₃ OH	35.2	3.22
Acetic acid	CH ₃ COOH	23.4	11.7
Ammonia	NH ₃	23.3	5.66

NH₃ :

$\Delta H_{\text{vap}} = 23.3 \text{ KJ/mol}$, $\Delta H_{\text{cond}} = -23.3 \text{ KJ/mol}$

$\Delta H_{\text{fus}} = 5.66 \text{ KJ/mol}$, $\Delta H_{\text{solid}} = -5.66 \text{ KJ/mol}$



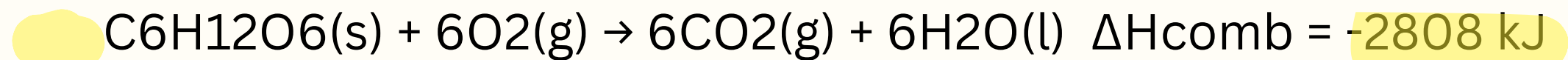
Combustion : is the reaction of a fuel with oxygen.

Combustion ---> exothermic

Food : is the fuel in combustion reactions in biological systems.

A bomb calorimeter is useful for measuring the energy released in combustion reactions. The reaction is carried out in a constant-volume bomb with a high pressure of oxygen.

How much heat is evolved when 54.0 g glucose (C₆H₁₂O₆) is burned according to this equation ?



$$(1 \text{ mol}) \rightarrow \Delta H_{\text{comb}} = -2808 \text{ kJ}$$

$$1\text{mol} \rightarrow 2808 \text{ KJ}$$

$$54\text{g} \rightarrow ? \text{ KJ}$$

54g to moles

$$\text{molar mass of } C_6H_{12}O_6 = 180\text{g/mol}$$

$$54\text{g} \times \frac{1\text{mol}}{180\text{g/mol}} = 0.3\text{mol}$$

$$0.3\text{mol} \rightarrow ? \text{ KJ}$$

$$\frac{0.3\text{mol}}{? \text{ KJ}} = \frac{1\text{mol}}{2808\text{KJ}}$$
$$= -842.4\text{KJ}$$



Have a nice day ★