

Key!

Chapter 5- Thermochemistry

What is the law of conservation of energy?

energy cannot be created nor destroyed.

What is the difference between an open and closed system? - Calorimeter

- Open: heat & mass can be exchanged with the surroundings

- Close: only exchange energy (heat) with surroundings.

The SI unit for energy is Joule (J)?

- calories (cal)
- KJ (Kilojoules)

The 3 parts of Thermodynamic quantities are _?

- Number
- Unit
- a sign (+) (-)

What is the equation when energy is exchanged between the system and the surroundings?

$$\Delta E = q + w$$

(heat) (work)
(energy)

Match the variables to statement: Given q, w, and ΔE

q (+) means system gains heat

w (-) means work done by system

w (+) means work done on system

ΔE (-) means net loss of energy by system

ΔE (+) means net gain of energy by system

q (-) means system loses heat

A system ⁺absorbs 900 J of heat, and the surroundings do 350 J of work ⁺on the system. What is the change in internal energy of the system?

$$\Delta E = q + w \\ = (+900 \text{ J}) + (+350 \text{ J}) = \boxed{+1250 \text{ J}}$$

A system ⁽⁺⁾absorbs 200 J of heat from the surroundings and does ⁽⁻⁾120 J of work on the surroundings. What is the change in internal energy of the system?

$$\Delta E = q + w \\ = +200 \text{ J} + (-120 \text{ J}) = \boxed{+80 \text{ J}}$$

Why is internal energy a state function?

independent of path by which the system achieved that state.

Heat (q) and Work (w) ^{are} NOT state functions

Define enthalpy:

heat change of a reaction at constant pressure.

Heat transfers always occur:

Areas of high temperatures to areas of low temp.

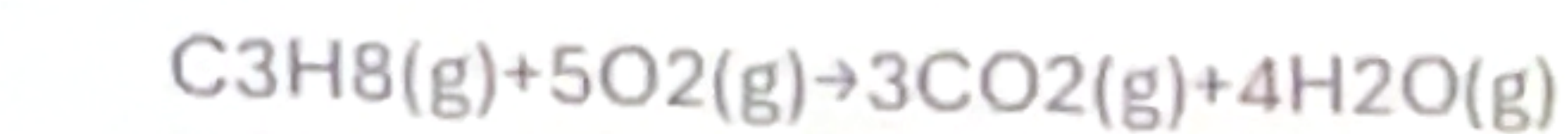
What's the equation for Enthalpy of Reaction?

final - initial

$$\Delta H = H_{\text{products}} - H_{\text{reactants}}$$

↑
enthalpy

How much heat is released when 3.75 g of propane (C_3H_8) is burned in a constant-pressure system?



C-3
H-8
O-10

C-3
H-8
O-10

$$\begin{array}{r} 3 \times 2 = 6 \\ + \\ 4 \times 1 = 4 \\ \hline 10 \end{array}$$

$$3(12.01) + 8(1.008) = 44.097$$

enthalpy

$$\Delta H = -2219 \text{ KJ} = 1 \text{ mol}$$

$$3.75 \text{ g } C_3H_8 \cdot \frac{1 \text{ mol}}{44 \text{ g } C_3H_8} \cdot \frac{-2219 \text{ KJ}}{1 \text{ mol}} =$$

$$\boxed{-189 \text{ KJ}}$$

Define Calorimetry:

Process of measuring the amount of heat released or absorbed during a chemical rxn.

What's the equation for Specific Heat Capacity?

$$q = m C \Delta T$$

mass constant Change in temperature
($T_f - T_i$)

How much heat is needed to warm 250 g of water from 23°C to 95°C? The specific heat for water is 4.184 J/g·°C. What is the molar heat capacity of water?

$$q = m C \Delta T$$

$$= (250 \text{ g}) (4.184 \text{ J/g} \cdot ^\circ\text{C}) (95^\circ\text{C} - 23^\circ\text{C})$$

$$= (250 \text{ g}) (4.184 \text{ J/g} \cdot ^\circ\text{C}) (72^\circ\text{C})$$

$$= 75312 \text{ J}$$

$$= \boxed{75,000 \text{ J}}$$

or

$$\boxed{7.5 \times 10^4 \text{ J}}$$