CONCEPTS OF ENTHALPY AND HEAT CAPACITY

$$Q = M C_p \Delta T = \underbrace{\Delta H}_{\text{change of enthalpy.}}$$

$$C_p \Delta T = \frac{\overset{KJ}{\Delta H}}{\underset{1/Kg}{M}} = \underset{KJ/Kg}{\Delta h}$$

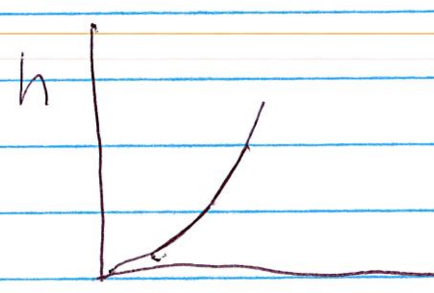
Specific Enthalpy

$$\boxed{C_p = \frac{\Delta h}{\Delta T} = \text{Slope}} \qquad (1)$$

What happens is a function of ~~Tim~~ Temperature?

How can we substitute Eq.(1) when $C_p \neq$ constant

$$\boxed{C_p = \frac{dh}{dT}}$$



what is c_p at $0°C$ for pure water? (2)

What is c_p at $100°C$ for pure water?

undefine but large or small?

$$c_p = \frac{dh}{dT} \simeq \frac{\Delta h}{\Delta T} = \underline{\underline{\infty}}$$

$$\frac{1\ \text{Cal}}{g\,K} \longrightarrow 4.18\ \frac{KJ}{Kg\,K}$$

HEAT CAPACITY OF A BIOMATERIAL CAN BE WRITTEN AS

$$C(\Theta) = (0.37 + 0.001\,\Theta)\,4.18\,(1 - X_w) + X_w\,C_w - 0.376\,\exp\left[-43\,X_w^{2.3}\right]$$

$X_w = 0.40$ (40% MOISTURE CONTENT)

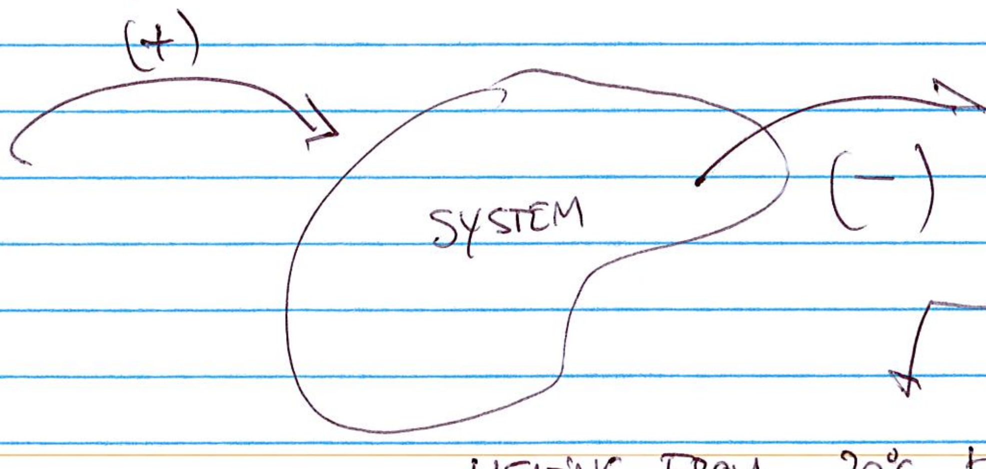
$M = 10\ Kg$

ENERGY TO HEAT THE PRODUCT FROM $20°C$ to $80°C$

$$\Delta H = \underset{kg}{M} \times \underset{\frac{kJ}{kg}}{\Delta h} = M \times \int_{\theta_1 = 20^\circ C}^{\theta_2 = 80^\circ C} C(\theta)\, d\theta$$

$$\Delta H = 10\,kg \times \Big[1.55\,(1-0.4)(80-20) + 2.09 \times 10^{-3}(1-0.4)\left[80^2 - 20^2\right] + 4.2 \times 0.4\,(80-20) - 0.37\,\exp(-43 \times 0.4^{2.3}) \times (80-20) \Big]$$

CONVENTION USED IN 201 & 202 REGARDING SIGN OF HEAT INPUT OR OUTPUTS



θ_1 θ_2

HEATING FROM 20°C to 80°C

θ_2 θ_1

COOLING FROM 80°C to 20°C