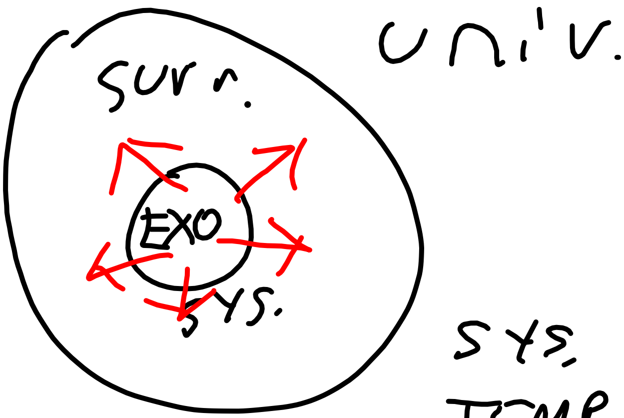
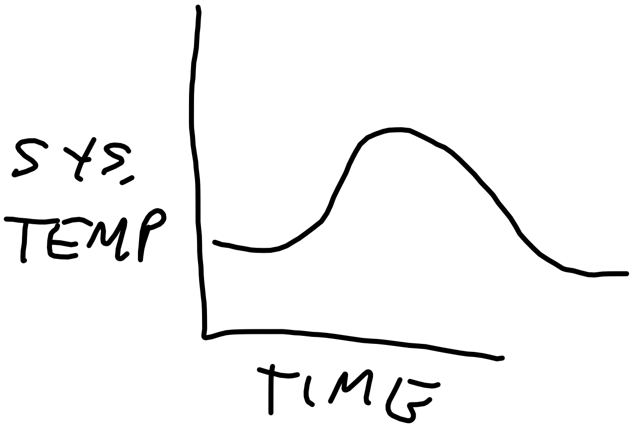
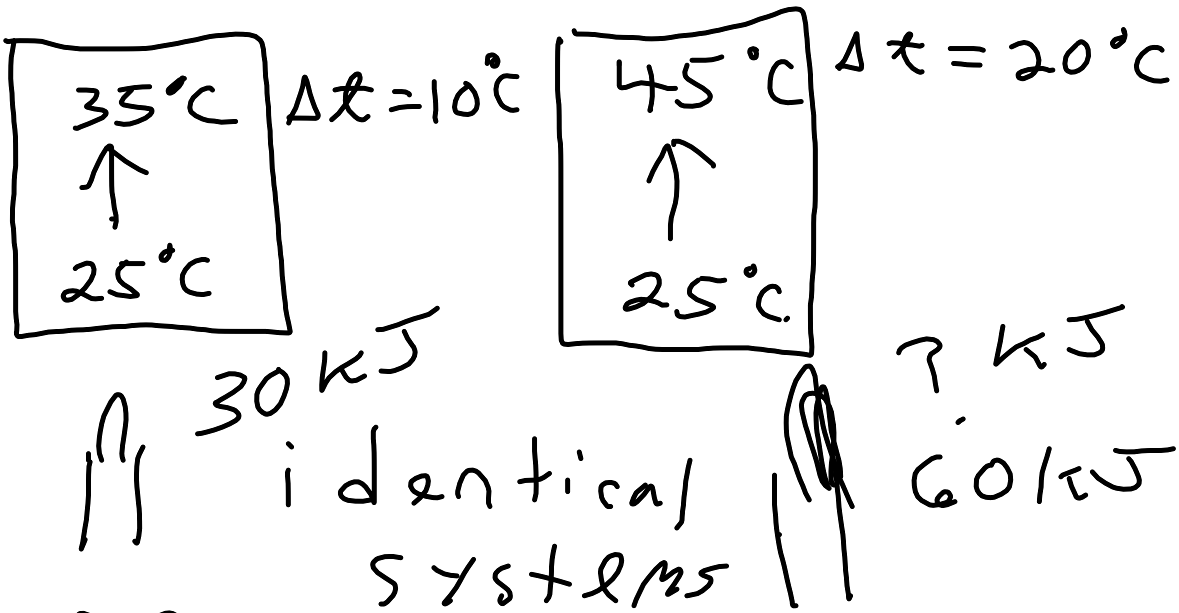

univ.
surr.
EXO
sys.


SYS. TEMP
TIME



DIRECT

X	Y
1	1.20
2	2.40
3	3,60
4	4,80

INVERSE

X	Y
1	120
2	60
3	40
4	30

q = heat flow

$q > 0$ (+ #)
heat goes in

$q < 0$ (− #)
heat goes out

$\Delta t = t_f - t_i$

$\Delta t > 0$ (+ #)
warming

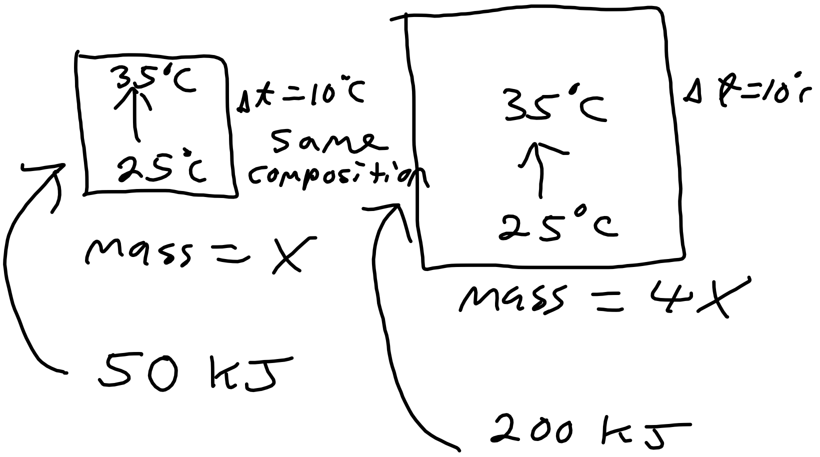
$\Delta t < 0$ (− #)
cooling

$q \propto \Delta t$

$q = C \cdot \Delta t$

↑ heat capacity

$J = \left(\frac{J}{^\circ C}\right) \cdot {}^\circ C$



$q \propto \Delta t$ fixed m

$q \propto m$ fixed Δt

↓ combine

$q \propto m \cdot \Delta t$

$q = c_p \cdot m \cdot \Delta t$

↑ specific heat capacity

$J = \left(\frac{J}{g\,^\circ C}\right)(g)(^\circ C)$

$H_2O : c_p = 4.18 \frac{J}{g\,^\circ C}$

How much heat is required to raise the temperature of 791 g of iron from 22.8 °C to 99.6 °C? The specific heat capacity of iron is 0.449 $\frac{J}{g\,°C}$.

$$q = c_p \cdot m \cdot \Delta t$$

$$\Delta t = t_f - t_i$$

$$= 99.6\,°C - 22.8\,°C$$

$$= 76.8\,°C$$

$$q = \left(0.449 \frac{J}{g\,°C}\right)(791\,g)(76.8\,°C)$$

$$= 27276\ J$$

$$27276\ J \left(\frac{1\ kJ}{1\times10^3\ J}\right) = 27.276\ kJ$$

$$\approx 27.3\ kJ$$

A 427 g sample of H_2O at 16.7 °C absorbs 22.4 kJ of heat. What is the temperature of the water after absorbing this heat?

$$\Delta t = t_f - t_i$$

↓

$$t_f = t_i + \Delta t$$

$$= 16.7\,°C + (12.6\,°C)$$

$$= 29.3$$

$$q = c_p \cdot m \cdot \Delta t$$

↓

$$\Delta t = \frac{q}{c_p \cdot m} = \frac{22400\,\cancel{J}}{\left(4.18\,\frac{\cancel{J}}{\cancel{g}\,°C}\right)(427\,\cancel{g})}$$

$$= 12.6\,°C$$

A 355 g sample of H_2O at 93.2°C loses 42.7 kJ of heat. What is the temperature of the water after losing this heat? The specific heat capacity of H_2O is 4.18 $\frac{J}{g\cdot°C}$

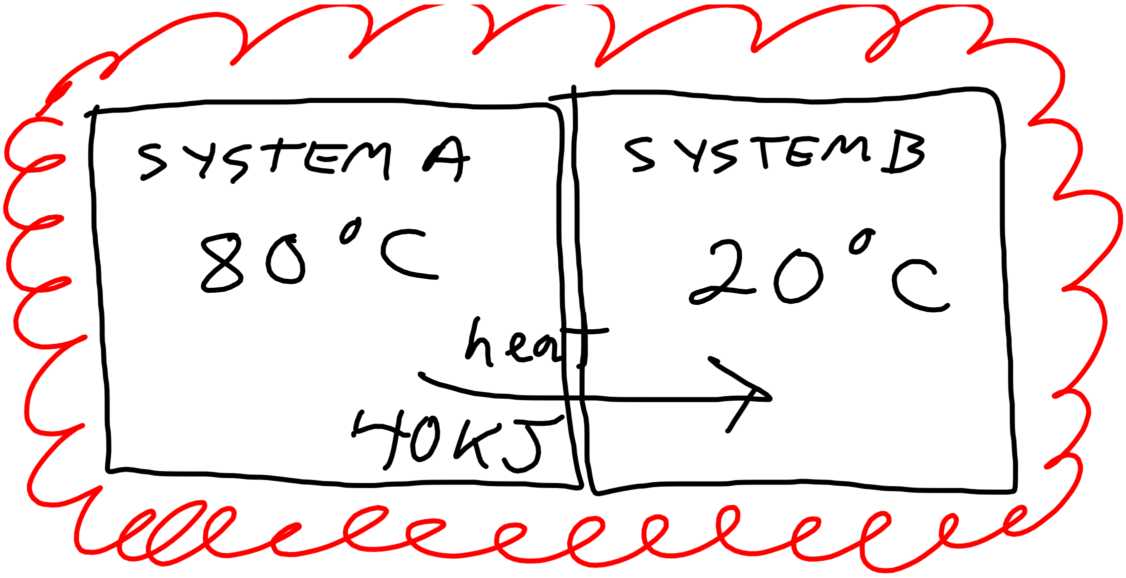
$$\Delta t = \frac{q}{c_p \cdot m} = \frac{-42700\ J}{4.18\ \frac{J}{g\cdot°C}(355\ g)}$$

$$= -28.8\ °C$$

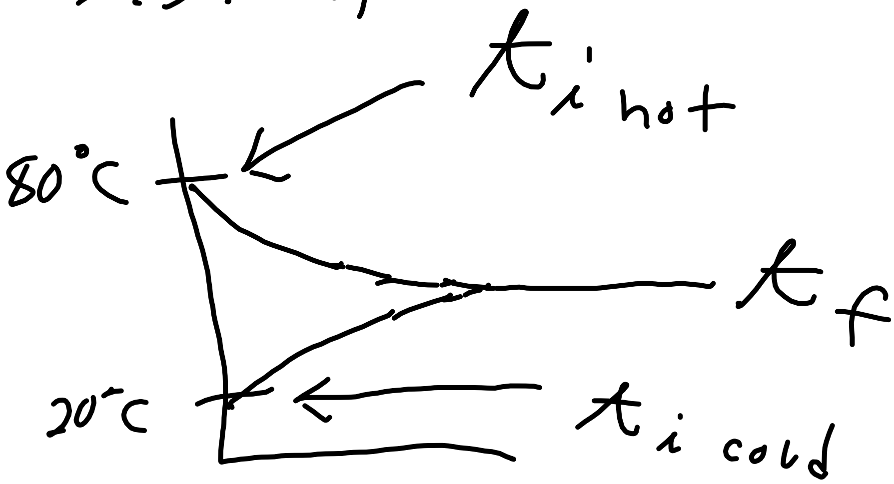
$$t_f = t_i + \Delta t$$

$$= 93.2°C + (-28.8°C)$$

$$= 64.4°C$$



2-compartment isolated system

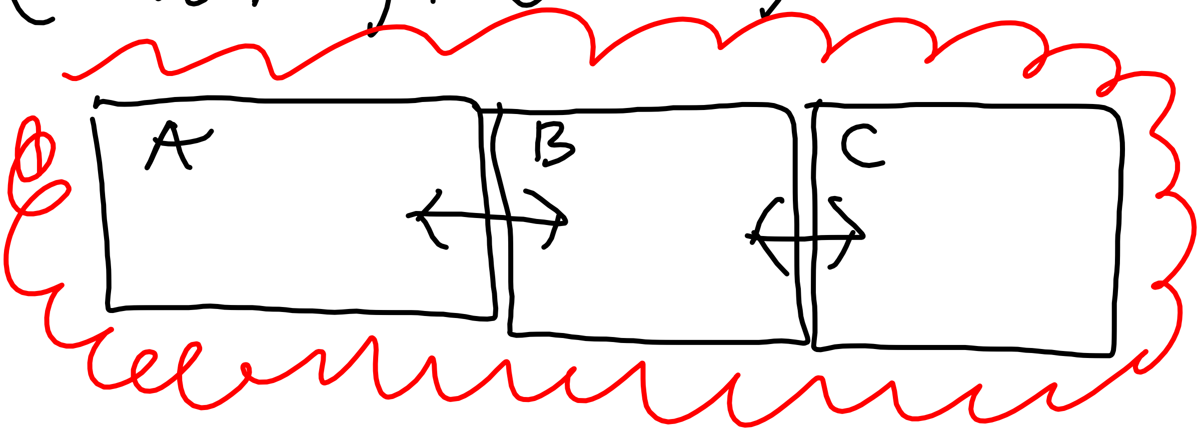


$q_A = -40\ kJ$

$q_B = +40\ kJ$

$q_A + q_B =$

$(-40\ kJ) + (40\ kJ) = 0$



$q_A + q_B + q_C = 0$

A 5.18 g sample of a metal was heated to 97.3 °C and dropped into a calorimeter containing 15.52 g of H_2O at 23.1 °C. The hot metal lost heat to the cool H_2O and the final equilibrium temperature was 28.9 °C. What is the specific heat capacity of the metal?