**Example**

Determine the final temperature of the mixture when 50 g of water at 80 ℃ is poured into a calorimeter cup containing 30 g of water at 20 ℃. The thermal capacity of the calorimeter is 60 J $K^{-1}$ and the specific heat capacity of water is 4.2 x $10^3$ J $kg^{-1}$ $K^{-1}$.

$°C^{-1}$ $°C^{-1}$

$4.2\ J\ g^{-1}\ °C^{-1}$

let x be the final temperature.

heat lost by 50g = heat gained by 30g + heat gained by calorimeter.

$$-\Delta Q_{\text{lost by water}} = \Delta Q_{water} + \Delta Q_{calorimeter}$$

$\Delta Q = mc\Delta T$

$\Delta Q = C\Delta T$

$$-(50g)(4.2\,J\,g^{-1}\,°C^{-1})(x - 80°C) = (30g)(4.2\,J\,g^{-1}\,°C^{-1})(x - 20°C) + (60\,J\,°C^{-1})(x - 20°C)$$

HINT! Your answer must be between 20°C and 80°C

~~54°C~~ ✓51.8° (52°C) ← $\frac{20500}{396}$

✓51.8° (52°C)

$$\Delta Q_{lost} = -\Delta Q_{gained}.$$

## Melting + Freezing

Consider ice below freezing + gradually add thermal energy

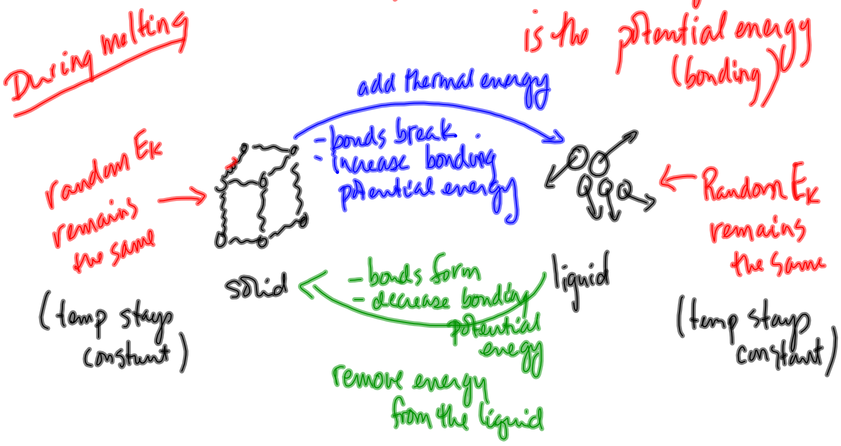
- temperature increases (increasing the kinetic energy of the particles)
- reach melting pt, then the particles can longer "stick" together → ice melts
- all energy goes into melting. (increasing potential energy due to bonding)


- opposite occurs during freezing (thermal energy is released, potential energy decreases)

- no temperature change during a phase

↓

the average random kinetic energy remains same → all that changes is the potential energy (bonding)




Boiling + Condensing .... same line of though as for melting / freezing.

Read over 3.2.1 to 3.2.6